EXCAVATING ENGINEER

FOUNDED 1905

Vol. XXX JULY, 1936 Number 7

TRANSPORTATION LIBRARY

rand Coulee as seen from the air is an imposing ectacle. In the foreground is Mason City, nnected with the government engineers' wn by the new steel highway bridge across e Columbia River. The curve of the cofferdam, hind which concrete is being poured, may be en in the right center. The excavating story Grand Coulee will appear in an early issue.

What's BACK of the DIPPER?

There are few operations in the construction industry that hold the interest of the contractor and the observing public quite as much as the working of a power shovel. The performance of the power shovel is fascinating to the onlooker . . . it means cold cash to the contractor. Both are interested in one question: "What's back of the dipper?"

As far as Diesel Shovels are concerned, the usual answer to that question is "Atlas Diesel," for there are today more excavators powered with Atlas Diesels than with the engines of all other Diesel manufacturers combined. Atlas Diesels pioneered the excavating field. They provided just what the contractors wanted . . . equipment built to withstand a beating . . . engines that would move maximum yardage at the lowest possible cost.

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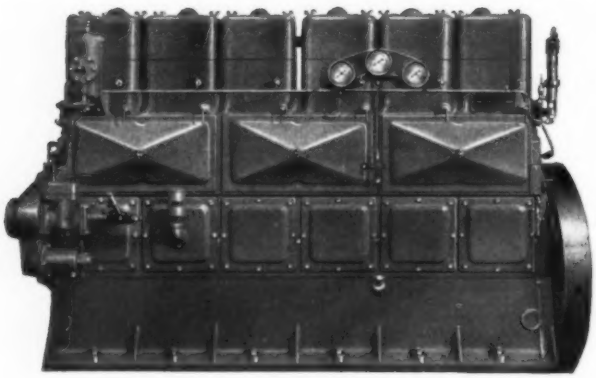

Atlas Diesels of the Industrial Type shown at the left are heavy duty machines operating at medium speeds. They are fully enclosed and dustproof, available in 3, 4, 6, and 8 cylinder models in the following range of sizes: 45, 60, 80, 90, 120, 140, 150, 165, 200, 275 H. P.

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draglines bring outstanding dependability to the job—a characteristic particularly appreciated when the job is in an isolated section, far from the conveniences of quick transportation, city supplies and repair shops. The Walker moves and operates in rough or soft footing. It saves time moving by stepping off in a direct line to the best operating position; handles big yardage at low cost. Bucyrus-Monighan Co., Chicago, Illinois.

Bucyrus - Monighan 150-B Diesel Dragline, owned by Carey, Baxter & Kennedy, Carbondale, Pennsylvania

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EXCAVATING ENGINEER

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DEVOTED EXCLUSIVELY TO EXCAVATION

About Excavating Projects — By Excavating Men — For Excavating Men — The World Over

Vol. 30 JULY, 1936 No. 7

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Grand Coulee ..... **Front Cover**

Six months ahead of schedule, work on Grand Coulee Dam goes steadily forward. This air view of the damsite and surrounding region gives an idea of the imposing aspect of the job.

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Looking Ahead

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Building Fort Peck Dam

Dredging operations for the earth fill core, diversion tunnel construction, and the excavation for the spillway will be presented in a series of articles starting in an early issue.

Dirt Flies on Belts

Badgett Construction Company handle 1,200,000 yards on Atlantic-Gulf Ship Canal with dragline loading Jeffry belt conveyor. This dirt moving unit proved speedy, economical and well adapted to job problems and contract conditions.

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F. O. WYSE
Managing Editor

ARNOLD ANDREWS
Editor

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D. B. REED, JR.
Assistant Editor

E. M. HEUSTON
Advertising Manager

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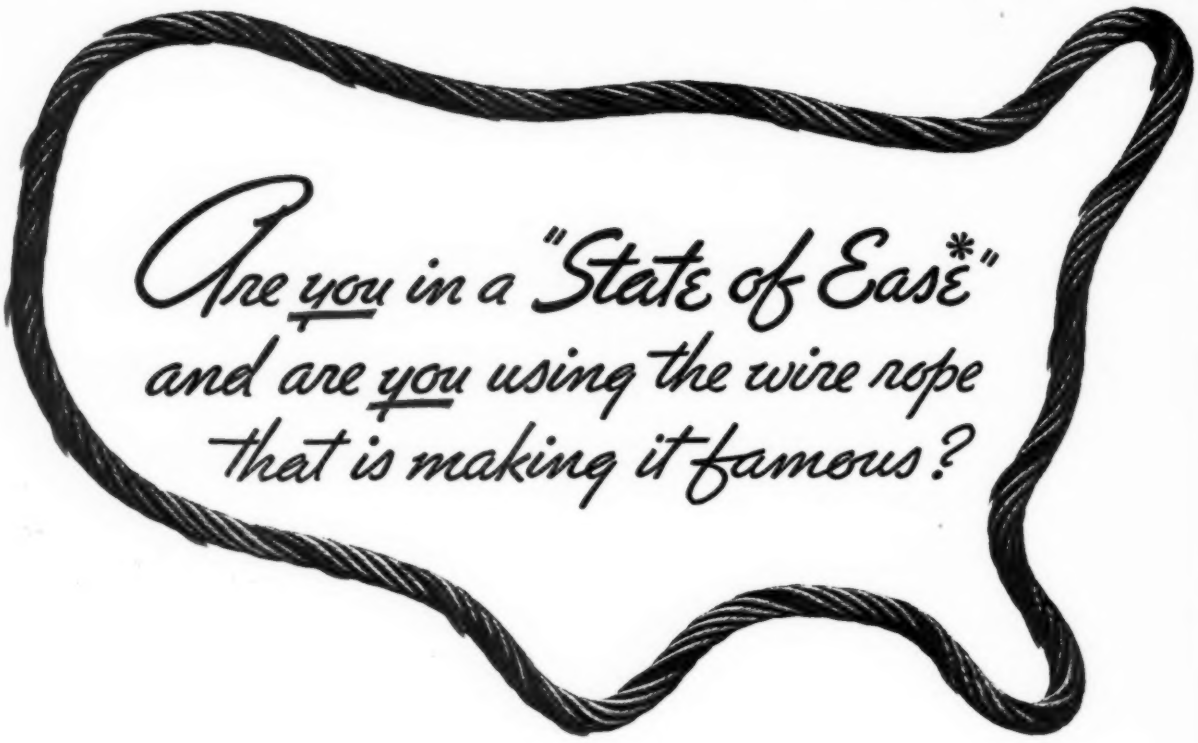

* The term "State of Ease" is taken from Slocum and Hancock's book "Strength of Materials" which quotes Prof. Karl Pearson: "A body which is free from internal stress is said to be in a STATE OF EASE."

ARE you, as a wire rope user, in a "state of ease"? Are you easy in mind—sure you are getting all that wire rope should give you? Are you using the wire rope that is "free from internal stress"?

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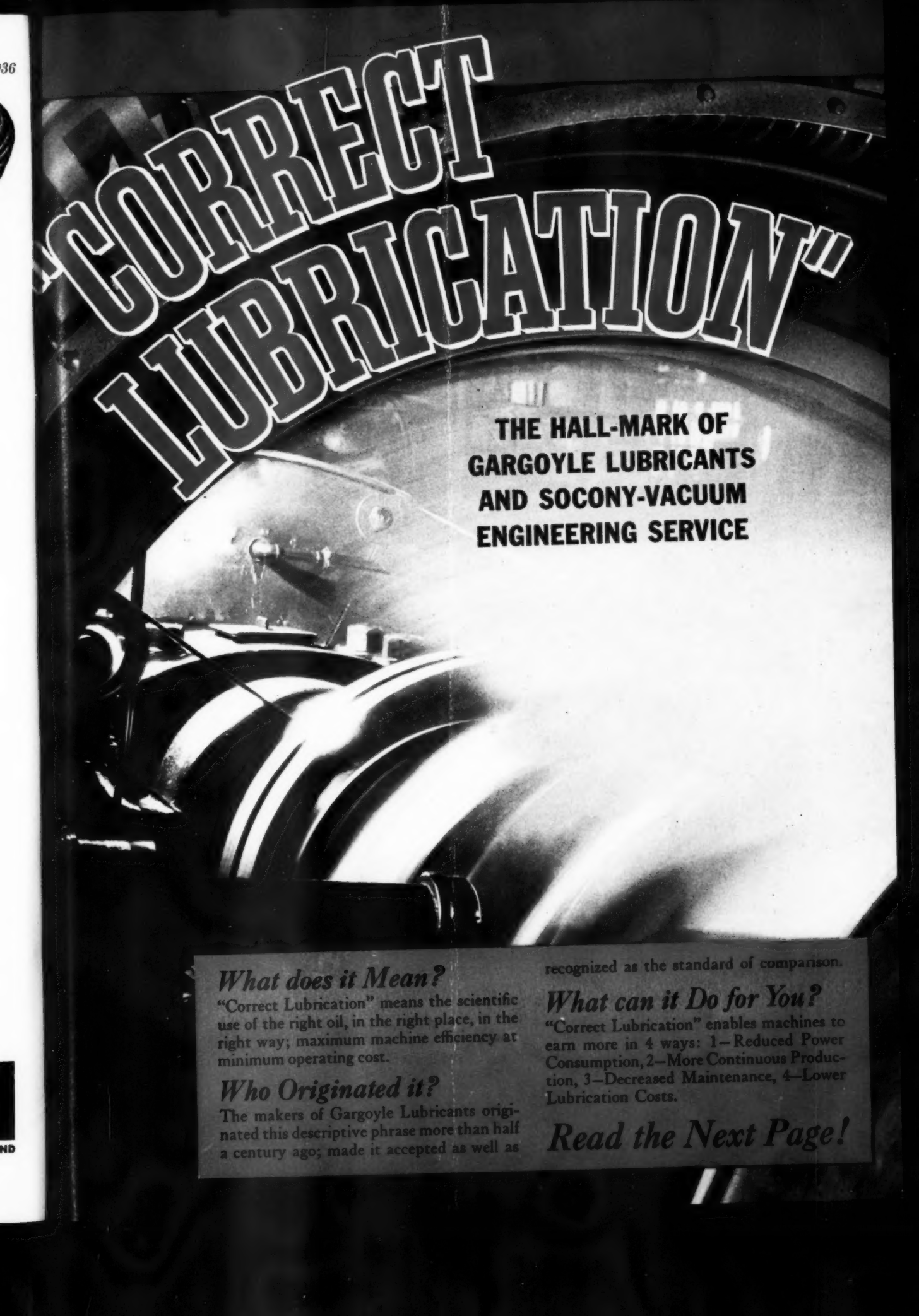
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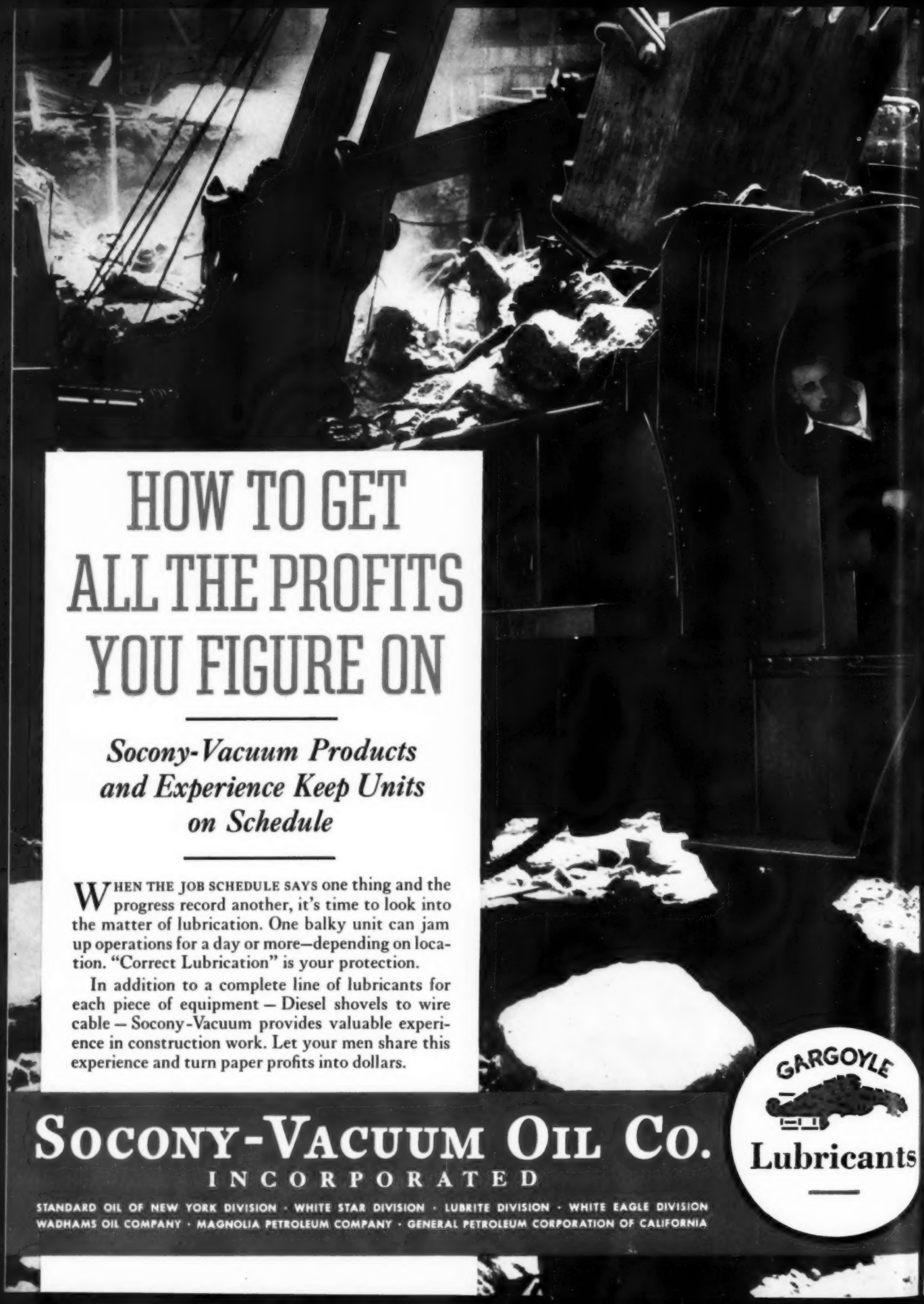

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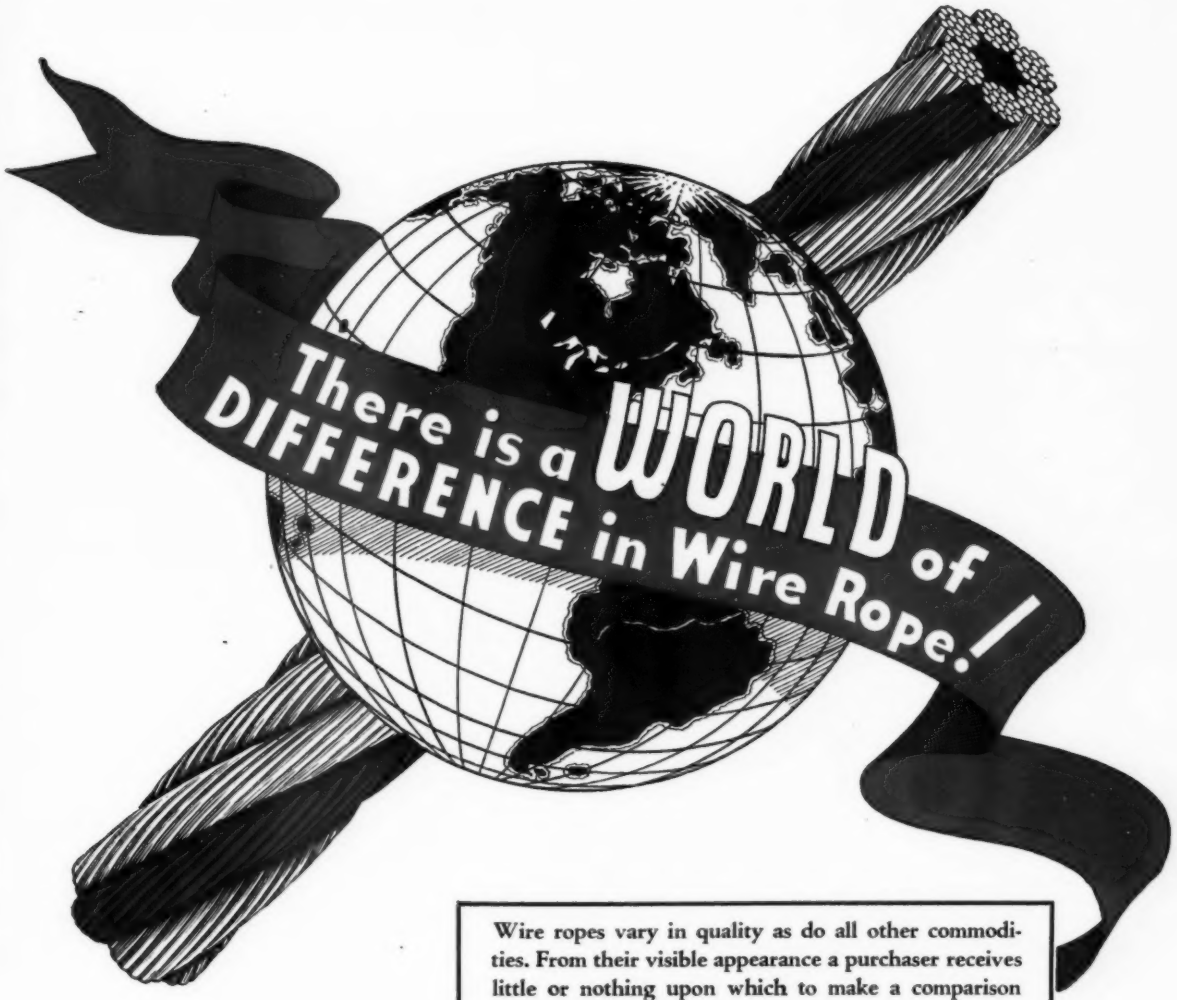

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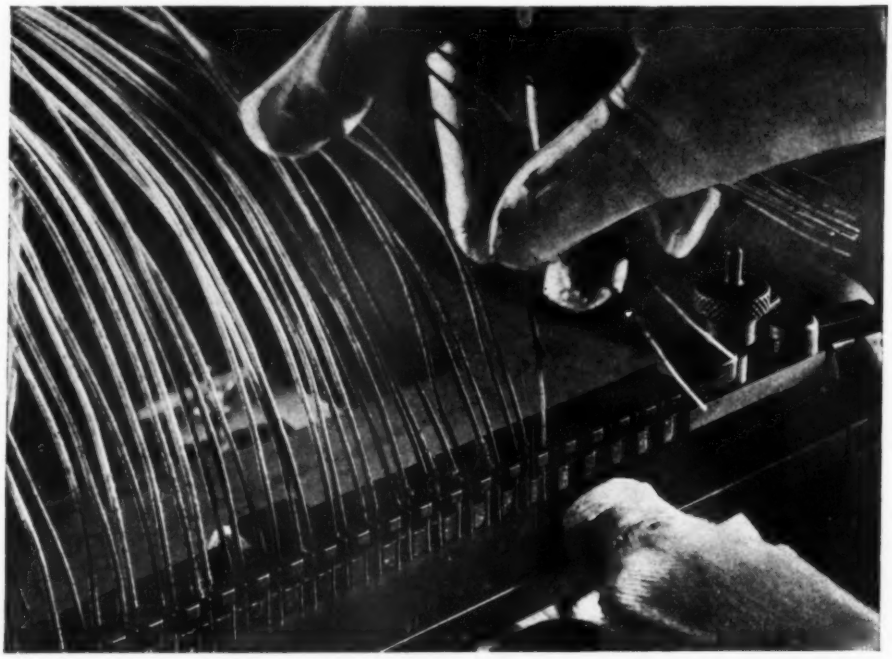

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Not in the Contract

Newspaper reporter: "And to what do you attribute your success?"

Wealthy contractor: "My wife."

Reporter: "Oh, her loyal help and—"

Contractor: "No, no. I just wanted to find out if there was any income she couldn't live beyond.

"I need a holiday," said a pretty cashier. "I'm not looking my best."

"Nonsense," said the manager. "It isn't nonsense; the men are beginning to count their change."

Country Constable: "Pardon, miss, but swimming is not allowed in this lake."

City Miss: "Why didn't you tell me before I undressed?"

Country Constable: "Well, there ain't no law against undressin'."

"I read in a book that Apollo was chasing a nymph and she turned into a tree."

"He was lucky. The one I'm chasing always turns into a jewelry shop or a restaurant."

Passenger: "I left a bottle of Scotch in the train this morning."

Conductor: "Was it turned into the Lost and Found Department?"

Passenger: "No, but the fellow who found it was."

A Republican's Lament

Sing a sad song for old Joe Dunner,
A cussin' fool of a shovel runner.
While diggin' the dirt with a B-E steamer,
He got shot for a p'litical schemer.

A damn good man with clutch or throttle,
But a sight too fond of tilting the bottle.
Got lit and behaved like he hadn't oughter
With the local Democrat's cross-eyed daughter.

Her Dad got sore and said, "You'll marry 'er."
"Before I do," said Joe, "I'll bury 'er."
The Democrat Dad was Acting Sheriff,
So he up an' shot Joe for breakin' the tariff.

Oh sing a sad song for old Joe Dunner,
That consarned fool of a shovel runner.
They dug his grave in the bottom of the quarry
And even the dame's dad was kinda sorry.

Now listen folks to the moral of the story,
Messin' with politics gets you no glory.
If you have to sling dirt, you'll have less trouble
If you stick to slingin' it with a shovel.

Wife: "The couple next door seem to be very devoted—he kisses her every time they meet. Why don't you do that?"

Husband: "I don't know her well enough yet."

Three storks were discussing the day's work.

First S.: "I had a busy day. I delivered 10 babies."

Second S.: "I wasn't quite that busy. I only took care of 5." They both turned to the third stork, who said: "I didn't deliver any babies today, but I did scare the devil out of two contractors' secretaries!"

Woman learning to drive: "But I don't know what to do!"

Her husband: "Just imagine that I'm driving."

Rag Merchant: "Any beer bottles, lady?"

Woman: "Do I look as if I drank beer?"

Rag Merchant: "Well, any vinegar bottles, lady?"

"Please don't ask me again," she begged wearily. "To be perfectly frank, only a fool would marry you."

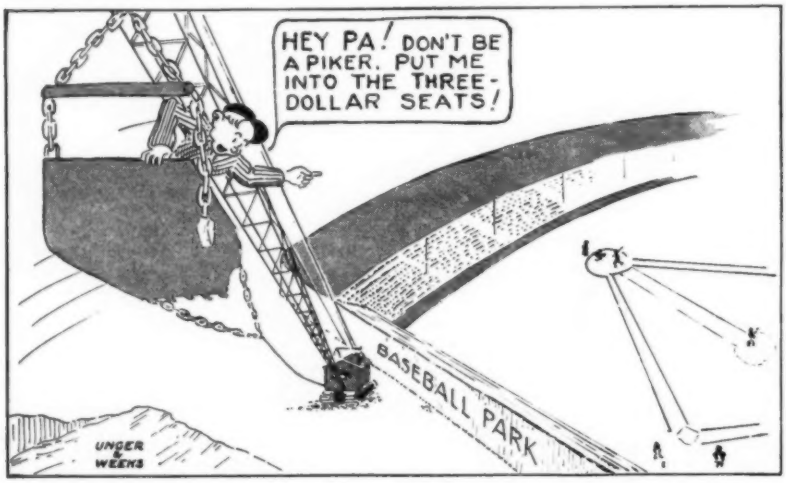
"All right," he snorted, peeved at last. "You've had your last chance!"

"I'm sorry—I quite forgot your party the other evening!"

"Oh, weren't you there?"

Looking for bait, a fisherman came on a snake which had just caught a frog. After several unsuccessful attempts to make the snake give up its prey, the man finally poured a little whiskey in its mouth. The snake dropped the frog immediately and slithered away.

Early next morning the fisherman went out again. He was halted by a tug on his trousers. There was the snake—another frog in his mouth.



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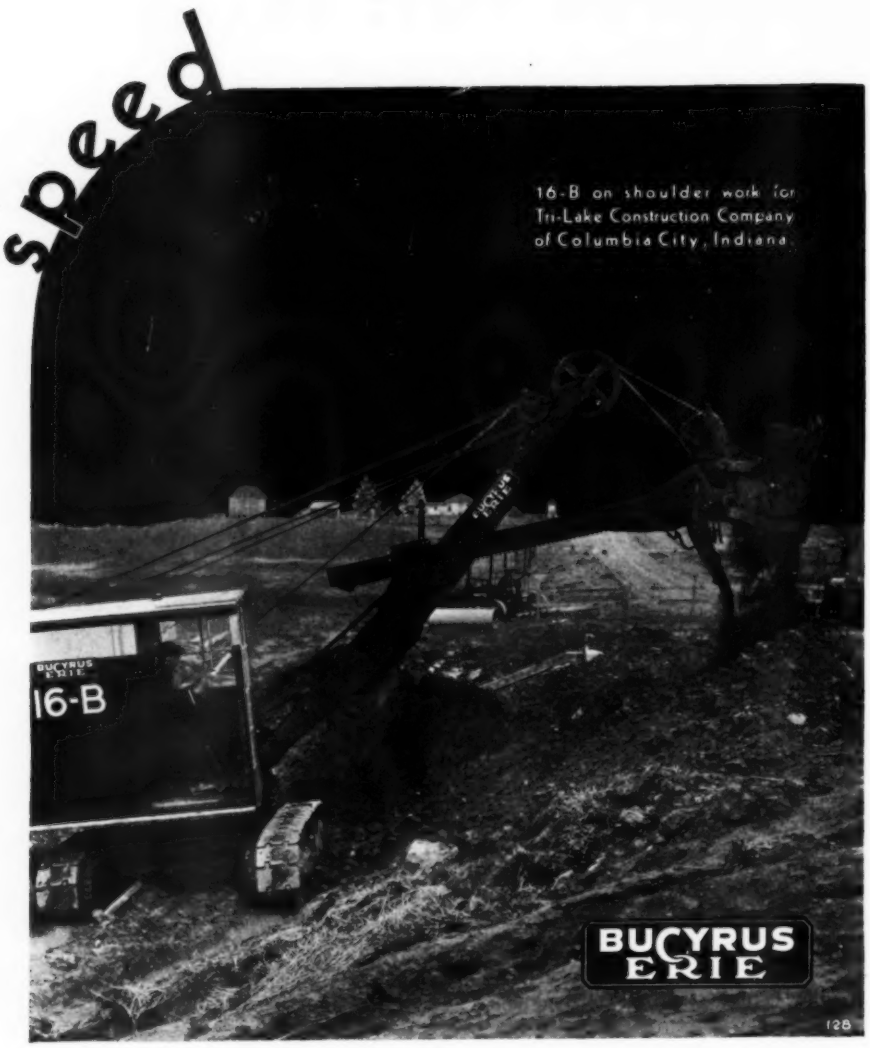

LIGHT WEIGHT, great strength, snappy control, and ample power all contribute to the Bucyrus-Erie 16-B's earned reputation for being the big producer in the ½-yard class. Though the weight is held to a minimum, the 16-B is really a heavy duty ½-yard machine and can be used with a ⅝-yard dipper for certain classes of work. It is just the machine for roadside aggregate plants or for general excavation. All operating levers are power set; hooked rollers eliminate center pintle and center pintle adjustments. Chain crowd, power dipper-trip, inserted-tooth dipper, two-speed propel. Investigate the 16-B. Or if a smaller machine will do, let us tell you about the famous Bucyrus-Erie 10-B.

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International Industrial Tractors and Power Units are first-line equipment on all kinds of projects. Here is a grader powered by International Diesel.

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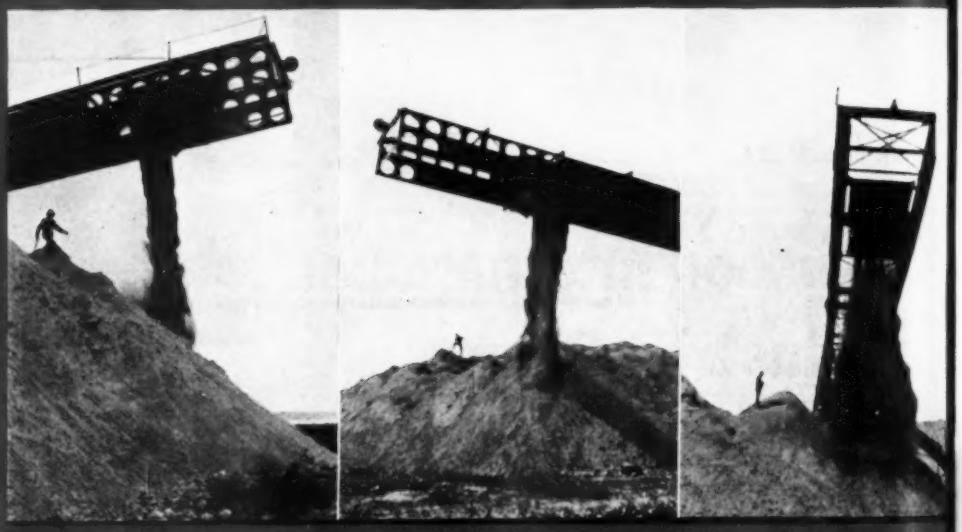
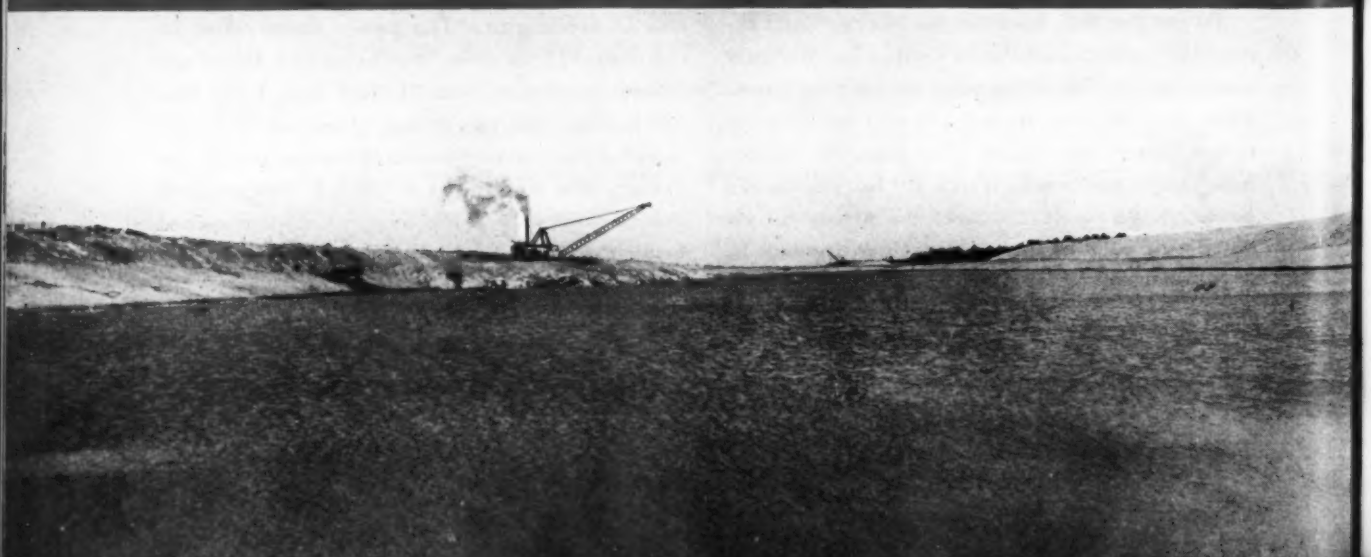


● *Above: This combination of Bucyrus-Monighan walking dragline and Chambers Bridge had a working range of over 500 feet. They finished up items 15 and 16 of the Atlantic-Gulf Ship Canal well ahead of schedule. Center: Three views of the discharge end of the Chambers Bridge in action. The 12-yard car can be dumped anywhere along the two "arms." Below: Item 29, dug by Lewis-Chambers with the Bucyrus-Erie 230-B steam dragline shown, as it looked on completion.*



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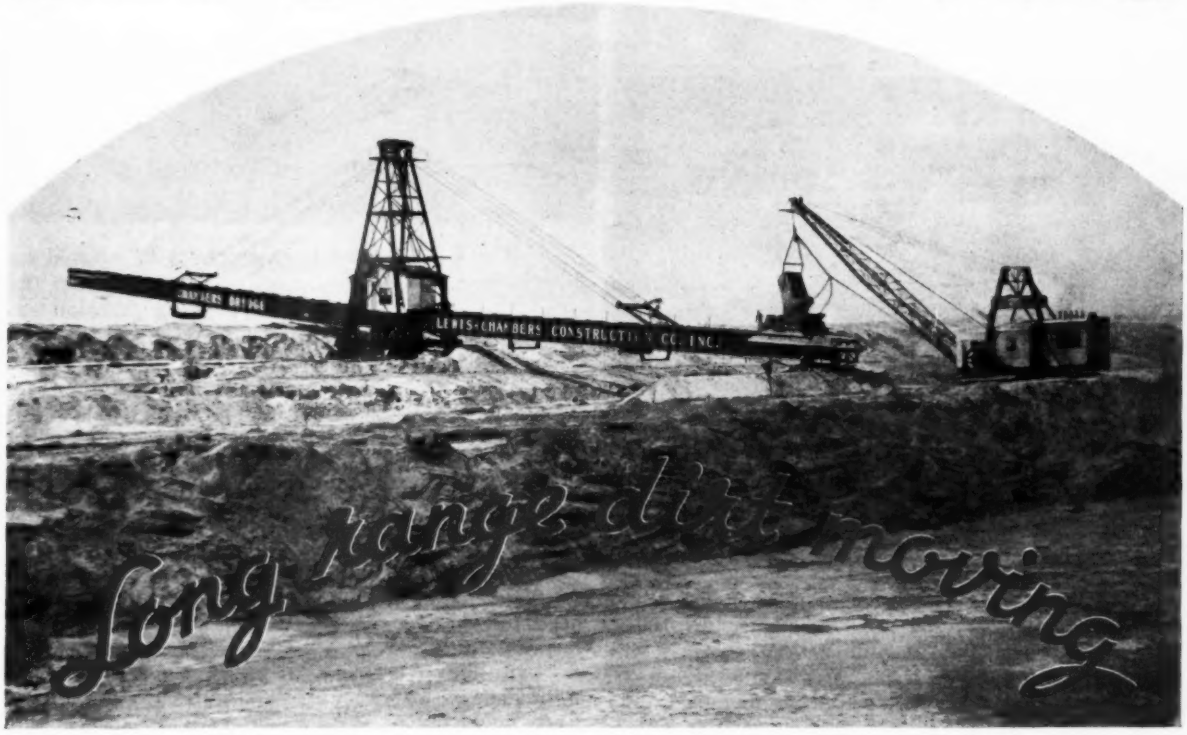
JULY, 1936 VOLUME XXX NO. 7



Chambers Bridge and Long Boom Dragline put Lewis-Chambers ahead of schedule on Atlantic-Gulf Ship Canal

BY L. H. HOUCK

AFTER watching the project being used as a subject for great political fanfare, advocates of the cross-Florida canal believed a major victory had been attained when the Senate included in the Deficiency Bill $10,000,000 which the President could allocate to the project, provided it was approved by a specially appointed committee of engineers. By a vote of 108 to 62, however, the House rejected this plan, and the bill was signed without provision for carrying on work on the canal. There is considerable doubt, however, that the eight contracts now being concluded will mark the final end of the project.

The interesting excavating aspects of these contracts were due principally to the dimensions of the canal, requiring long range dirt moving, and to the requirement that 1,500 man hours of labor taken from Florida relief roles be provided for each $1,000 of the contract. The special equipment put on the job by contractors to handle the first problem, made economical use of the hand labor a perplexing task. Much ingenuity was shown by contractors in combining the most modern machinery with ancient pick and shovel methods, yet still moving dirt economically and coming out ahead of schedule.

Lewis-Chambers Handle 1,973,000 Yards on Four Items

From the equipment angle, one of the most interesting jobs was that handled by Lewis-Chambers Construction Company of New Orleans. They had items 15 and 16, involving 1,117,000 yards, and items 29 and 30 containing 856,000 yards. The cut on items 15 and 16 varied from 12 to 30 feet in depth, and carried a 420-bottom with approximately 600-foot top width. The canal excavation is separated from the toe of the embankment by a 100-foot berm, and the embankment itself is 250 to 350 feet wide by 25 feet high. Material excavated was principally a dry sand, much of it tightly cemented and mixed with yellow and red clay.

To eliminate rehandling of dirt from canal to spoil pile forming the canal embankment, Lewis-Chambers moved their Chambers Bridge in on the job. This unique machine, somewhat resembling in appearance a gigantic bird with outstretched wings, was originated by John T. Chambers, company vice president, and designed and built by Bucyrus-Erie. A complete description of this unit was

• *Below: The 5-W steps out, moving closer to the canal. The man on top of the machine is cleaning up—possibly for a visit from newsreel cameramen. Right: The car dumps another load on the spoil bank. The men shown then grade the dirt by hand.*

published in the November, 1934, Excavating Engineer, in connection with an article describing levee work on the Mississippi By Lewis-Chambers Construction Company.

Briefly, the Chambers Bridge consists of a central tower housing power and control units, from which two 175-foot horizontal structural steel arms project in opposite directions. These bridges are supported by wire rope running over an "A" frame and down to drums in the engine room, and may be raised or lowered to attain the angle best suited to operating conditions. The entire machine is self-propelling, being mounted on caterpillar trucks, and can be manoeuvered into working position with almost the speed of a large dragline.

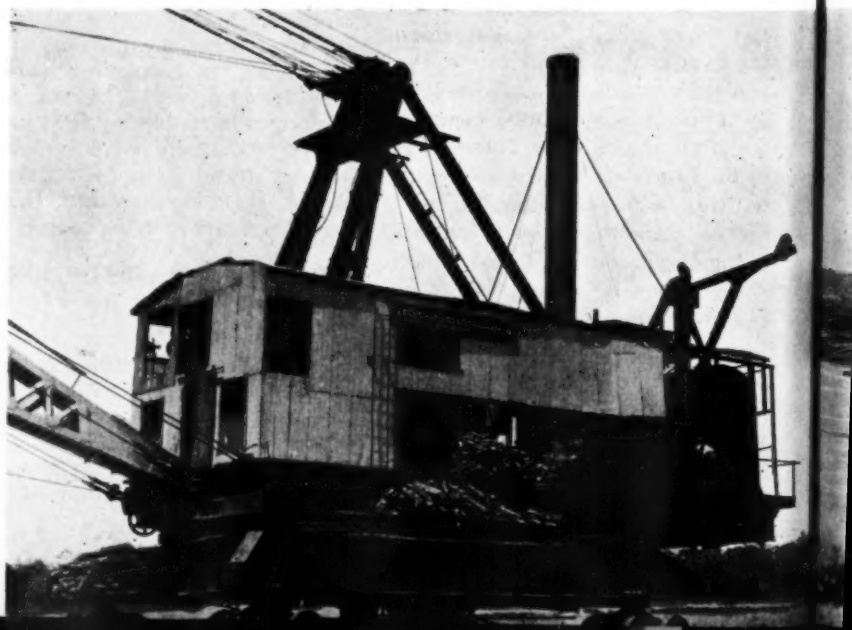
Inside the "arm" structures are tracks for a 12-yard dump car, electrically controlled from the central tower, which can be dumped anywhere along the arms. This car makes a complete cycle in 50 seconds or less. It is loaded automatically from a stationary hopper at one end of the Bridge, a time saving feature because the hopper can be loaded while the car is on the move.

An Eight Mile Walk to the Job

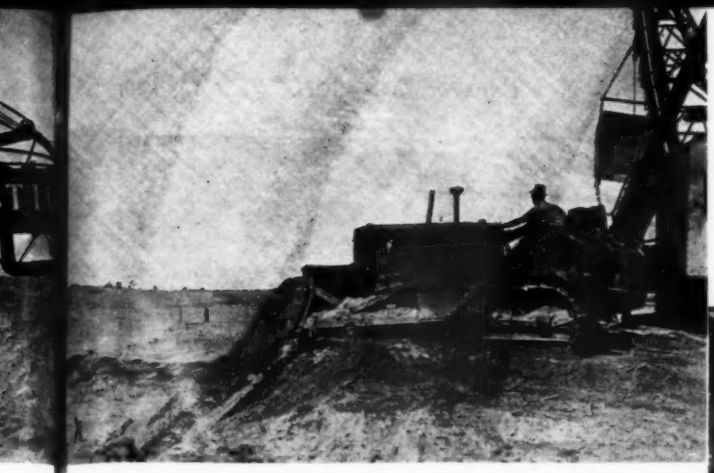
To work in combination with the Chambers-Bridge, a Bucyrus-Monighan 5-W walking dragline was purchased. "Walker" is an appropriate name for the machine ir view of the fact that it "tramped" eight miles through Florida woods from the nearest railroad station to the job. Equipped with an 80-foot boom swinging an 8-yard bucket, the 5-W proved an ideal working partner for the Bridge. Its walking traction enabled it to keep right on digging and moving when weather conditions forced other equipment to shut down. The Bridge also showed to particular advantage under adverse weather conditions, the car having no traction problem and being able to handle wet or dry material with equal facility.

Operating in combination, the two machines had a working range of over 500 feet. This, in conjunction with the Bridge's ability to dump over a wide range both horizontally and vertically, greatly simplified the job of shaping the spoil pile into the final canal embankment as the work went along. Finishing was done by hand and bulldozer.

Dragline and Bridge handled an average of 8,000 to 10,000 yards per day, with a maximum day of 14,690 yeards. It was necessary to move much of the dirt 500 feet horizontally and from 25 to over 60 feet vertically.



• *Converted from a coal burner in order to take advantage of the Florida pine found right on the job, the 230-B set digging records. The pine was dry and full of rosin and burned excellently. Some of the 20 cords used daily can be seen piled all over the machine.*



• *Left: A Caterpillar tractor and bulldozer level off a pathway for the Bucyrus-Monighan dragline. Below: The required relief labor was used to load dirt by hand. Lewis-Chambers bought 15 of these Ford V-8s and rigged them with flat wood dump bodies made on the job.*

Handling the Relief Labor Stipulated in the Contract

In order to make the best use of the relief labor required by the terms of the contract, Lewis-Chambers bought 15 Ford V-8 trucks, loaded by hand and used for the odds and ends of dirt moving. It is estimated that the amount of work done in this way was just about sufficient to pay the cost of the labor. The 10 per cent skilled labor allowed was ample to provide for operation and maintenance of the dragline and Bridge.

In addition to these machines and the trucks, other equipment used on items 15 and 16 included a 1½-yard P&H which was used as a crane and general utility machine; and four Caterpillar 75 tractors, two of which were equipped with La Plant Chote bulldozers, and were used for grading and finishing work.

The shop maintained at the job was equipped with both electric and oxygen welding outfits which handled necessary repair work.

Dirt Moving in the Movies

In addition to the usual curious crowds which gather to watch excavation jobs, news reel companies and press photographers, attracted by the national interest aroused by the canal, made items 15 and 16 a port of call. Pathe News had two sound trucks and a six-man crew filming the 5-W and the Chambers Bridge; and the machines were also the center of attraction for the March of Time photographers.

Publicity was not allowed to interfere with the business of moving the dirt, however, and Lewis-Chambers went ahead to such good purpose that they finished up items 15 and 16 over three weeks ahead of schedule.

Adapting Dragline to Conditions on the Job

Items 29 and 30, near Dunnellon, were also handled by Lewis-Chambers. The principal piece of equipment used here was a Bucyrus-Erie 230 dragline swinging an 8-yard bucket on a 175-foot aluminum boom. The ingenious manner in which this machine was adapted to local and contract conditions received a well-deserved reward when the two items were finished well ahead of schedule.

Before this job, the 230 was an oil burning steam rig. But with an unlimited supply of Florida pine, full of rosin and an excellent heat producer, at hand, A. H. Milam, superintendent on these two items, converted the dragline to a wood burner. The required relief labor was used to cut the wood from the right of way and truck it to a half-mile-

• *Item 29 was the first on the canal down to water. The bucket of the 230-B is shown digging under water near the windup. Despite the escaping water which carried away dirt and made it impossible to carry a full bucket, the dragline averaged over 8,000 yards a day.*

• *Eight yards of dirt go into the hopper of the Chambers Bridge. When full, the hopper dumps automatically into the car which is electrically transported to the discharge end of the bridge.*

long wood pile along the path of the dragline. From there it was stacked on the machine and used as needed. Twenty cords a day were needed to "keep the pot boiling." Use of this excellent fuel contributed in no small measure to the production records made on these items, as well as providing a profitable use for hand labor, one of the main problems on the canal.

The 230 was mounted on standard gauge railroad trucks, and laid its own track. Sections of rail and ties were picked up by hooks and chain slung around the bucket. Track was laid every 24 hours, about 250 feet being laid in 45 minutes.

CANAL HISTORY BRIEFLY SUMMARIZED

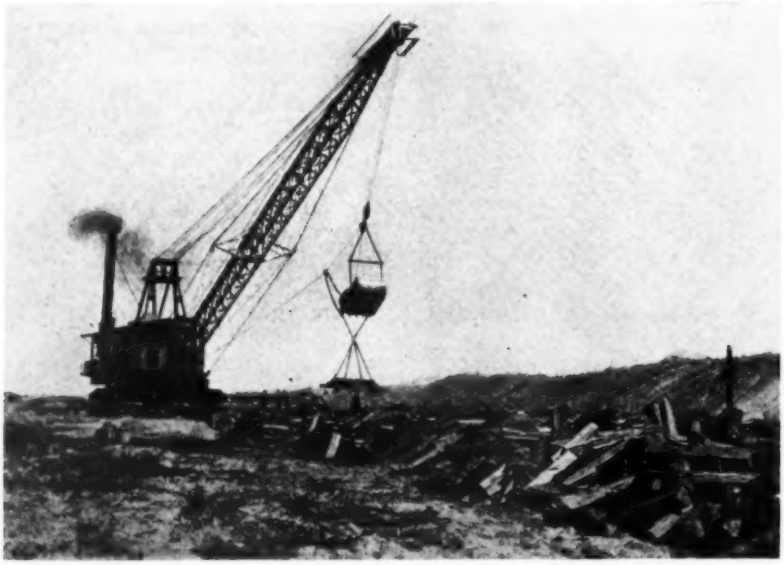
"THE canal has as many lives as cat—and has only used two." So runs a saying current in Florida. Despite the recent reverse in Congress, there may be enough truth in the saying to make a brief review of the history and debate about the canal pertinent.

A cross Florida canal was proposed as early as the 1600's, by the Spanish. Later, surveys for such a canal were made by the French and, in 1830, by the United States. The cost of the undertaking, however, always proved the stumbling block to action. Establishment of PWA reopened the subject and reports were made in 1933 by PWA engineers, and in 1934 by army engineers.

In Florida itself, sentiment about the canal was sharply divided, and still is. One group feared such a canal would ruin the peninsula's water supply by lowering the water table and injection of too much salt. Further, they claimed that the cost of the project was far greater than possible benefits. The opposition claimed that engineering reports gave assurance that damage to water supply would be minor and purely local. They also claimed the immediate advantage of creation of work and the long run saving in shipping time and loss between the Gulf of Mexico and the East which would result from the elimination of the trip around the tricky Florida coast.

After further study by PWA and army engineers, President Roosevelt started actual work with an allotment of $5,000,000 in relief funds. Eight contracts, seven of them for excavating, were let in the central portion of the proposed canal. While the possibility of a lock canal was not definitely closed, plans proceeded on the basis of a sea level project, to utilize existing waterways wherever possible.

What will come next lies in the haziest realm of speculation.



• *Left: John T. Chambers, Lewis-Chambers vice president, who conceived the Chambers bridge and designed it in collaboration with Bucyrus-Erie engineers. Right: George Irving, Lewis-Chambers manager.*

Under-Water Digging

Digging problems here were somewhat different from those on items 15 and 16. The material was tightly packed sand with little or no clay, and as this was one of the first sections down to water, the final digging had to be done under water.

Necessarily, this slowed down output, as water which escaped when the bucket was lifted took considerable sand along, making it impossible to carry the bucket completely full. Nevertheless, the dragline averaged over 8,000 yards a day over the whole digging time. Item 29, one of the first finished and graded, and filled with water, was one of the show places of the canal, attracting many visitors.

Including both skilled and relief labor, Lewis-Chambers employed an average of 600 men on its four items. Personnel of the company itself includes:

J. H. Lewis, president, in direct charge of operations on this canal; George Irving, manager; Thomas Barrett, superintendent on items 15 and 16; and A. H. Milam, superintendent on items 29 and 30. Much credit is due these men and their assistants for the excellent way in which they carried on the work.

• *Every 24 hours the 230-B laid about 250 feet of track, shifting in in sections from rear to front as shown here. Note also the next day's fuel supply piled along the path the machine will work.*

• *Fishermen's huts in this native kampong had to come down to make room for the airport. Despite compensation offered by the government, the natives objected —but had to give way to 20th century needs.*

Building an Airport in Singapore

260 Acre Flying Field and Seaplane Base Built with 9 Ruston-Bucyrus Excavators

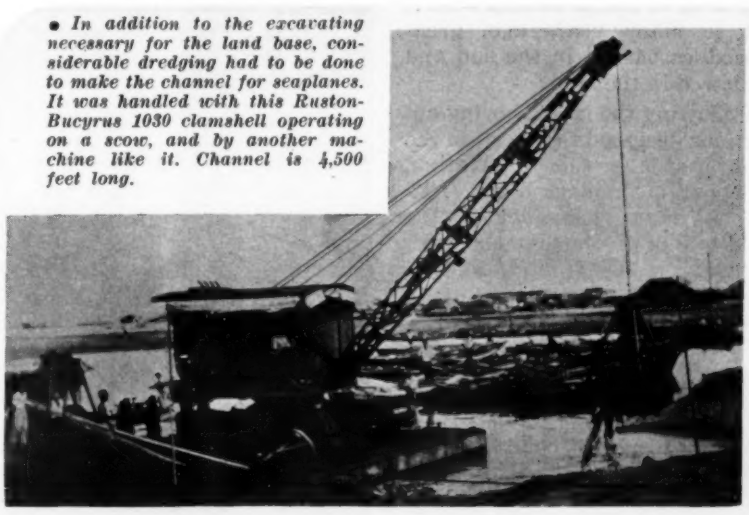
By J. F. FRIEND

THE AIRPORT now in course of construction at Kallang, Singapore, bids fair to become one of the most important links in commercial air transport and communication, not only of the British Empire, but of the World. Situated as it is on the main shipping route to the Far East, there is every indication that Singapore will, in the future, hold a position in importance as an airport second only to that of its shipping.

At present, landing facilities at Seletar are utilized by the British machines carrying the mails to and from Australia, and the Dutch-owned K.P.M. planes flying to and from the Dutch East Indies. These services have been doubled within recent times and there is every indication that the amount of aerial traffic, when fully developed, will continue to increase at a very rapid rate. It is foreseen that the way will soon be opened up to regular aerial communication with China and the Philippines doubtless with an eventual linking with American airways to form a system of aerial transport to circumnavigate the globe.

The question of selection of site was a difficult one, but finally the choice fell upon an area within the vicinity of the 40 year old fishing *Kampong* of Tanjong Rhu, where some 6000 souls, predominately Chinese, existed; gaining their livelihood mainly by means of fishing, the plying of sampans and the building of small craft. Tanjong Rhu consisted of some 300 hovels where the natives lived in structures raised on piles over the water, a type of dwelling, the origin of which is long since lost in antiquity.

Although compensation was offered by the local government to these hut dwellers, or squatters, as they are termed locally, their ejection was not effected without difficulty, for these people were loth to leave their primitive homes in spite of the wretched conditions under which many of them lived. Their ejection, however, not only paved the way



• *In addition to the excavating necessary for the land base, considerable dredging had to be done to make the channel for seaplanes. It was handled with this Ruston-Bucyrus 1030 clamshell operating on a scow, and by another machine like it. Channel is 4,500 feet long.*

for an important air port but assisted considerably in the clearance of slum areas.

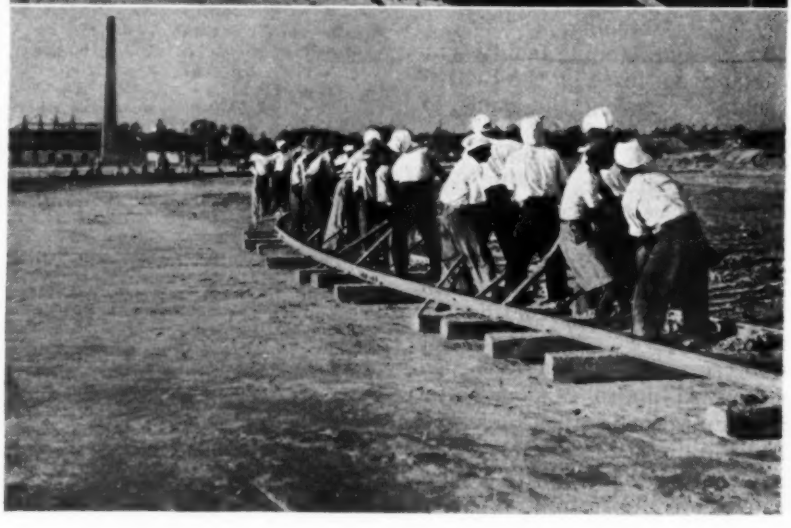
The site selected for reclamation lay in the estuaries of three small rivers, a large part of the area being virtual swamp on deltaic mud flats.

When this ambitious scheme is completed the service will consist of a very modern and efficient system of landing facilities for both airplanes and seaplanes with all the latest refinements and conveniences, to designs based largely upon experience gained from the past working of important air ports already in existence in other parts of the world. There will be hangars and sheds for land and sea machines and offices and workshops of modern design and architecture. Facilities for air passengers will be provided in the main building by an elaborate and well considered system for the handling of baggage, mails and freight. A restaurant will be available together with wireless facilities and meteorological information. Recognized danger signals will indicate the elevated parts of the building.

The domed landing ground is to be 1000 yards in diameter and the total area of the completed service will cover about 260 acres, turfed with a grass specially selected for its quality of toughness.

Many problems had to be faced by the engineers in the task of converting into a modern airport this area of foetid swamp where, not so many years ago, great crocodiles basked in the sun and wallowed in the mud.

Following the initial boring operations designed to ascertain the nature of the subsoil stratum, work was commenced in 1932. The job is being executed by the Public Works Department with directly employed labor and at an originally estimated cost ap-



• *Top: One of the nine Ruston-Bucyrus 32-Rs on this job handling some of the toughest material that went into the fill. Center: Trains of filled cars waiting to be hauled to the fill four or five miles away. Bottom: Indian coolies moved track often to cover a wide area for distribution of the fill.*

• *A fleet of tractors was used on consolidation. This Caterpillar Fifty was one of them. In the background an R-B clamshell is filling in a trench. All machines had to have roofs protecting the operators from India's hot sun.*

proximating £730,000, or about $3,600,000.

The supply of a sufficient quantity of a suitable earth filling necessitated early consideration. It was eventually decided that this should be obtained from *Kampong* Batak some four miles distant from the site. An analysis proved that the material from this source consisted of approximately 43% of impervious clay and 57% of gravel and sand.

Here was a great hill which it was decided to attack systematically by means of mechanical excavators. Operations were commenced near the top and were continued by working downwards in shelves or benches of about twenty feet at a time. For this purpose five type 32-B Ruston-Bucyrus electrically operated excavators were utilized, together with two steam driven Wilson shovels of one cubic yard capacity. A total output of about 8,000 cubic yards a day was achieved, hand labor being handled by 400 to 500 coolies.

Machines Given Performance Tests Before Accepted

The five electrically driven units, before being accepted, were required to pass certain performance tests including the digging and loading into three-cubic-yard cars at the rate of 60 cubic yards per hour, typical samples of the material to be excavated having been forwarded in advance to the manufacturers.

It is noteworthy that the result of the tests exceeded the requirements, and it has been found that the requirements as laid down were eventually still further exceeded by these machines.

The estimated requirements for earth fill, including the requirements for raising the surface is over seven million cubic yards. The supply of such a quantity is an exacting test upon the excavating plant, a test to which the machines have stood up remarkably well.

• *In order to keep this Ruston-Bucyrus 32-B, one of nine on this job, constantly producing material for fill, two levels of track were used. While cars on one level were being filled, those on the other were hauled away and replaced by a train of empties. Note aluminum paint on the shovel for heat protection.*

The Wilson shovels are now no longer in use, but today there are nine 32-B Ruston-Bucyrus machines continually at work, and the staff speak highly of their achievements.

The excavated material is transported in double tip cars of 3 cubic yards capacity, hauled in trains of 40 by light engines over tracks which have been laid from source to destination. These pass enroute through a large rubber plantation where hundreds of rubber trees are ranged in precise and dignified symmetry on either side of the track. Trainloads of earth fill continue to rattle over the track daily, maintaining a schedule requiring the use of hundreds of cars and probably a dozen locos.

Reclaiming the Swamps

The task of reclamation has been tackled on the broad lines of dividing the site up into areas

(Continued on page 376)

Digging One Approach to San Francisco Bay Bridge

Joe Catucci's Three Bucyrus-Erie Shovels Make Smooth Work of 125,000 Cubic Yard Excavation for Underpass In Oakland, California.

By D. W. EVANS

AWARD in October, 1935, of a $360,000 underpass job in Oakland, California, might at first suggest the elimination of another of the thousands of dangerous railroad crossings which are a menace to life. Actually this underpass beneath Peralta and Adeline Streets and San Pablo Avenue is as much a part of the San Francisco-Oakland Bay Bridge as the lower deck girders which are being laid as this is written. Over these girders before next Thanksgiving Day commuters will speed in fast electric trains, while other commuters travel in their automobiles on the upper deck of the bridge. The same automobiles, many of them, will have passed through this underpass which connects Moss Avenue with the bridge, eliminating all intersecting traffic.

The underpass project involved the removal of 125,000 cubic yards of dirt, which has been handled "with neatness and dispatch" by Joe Catucci, well-known excavating contractor of Oakland. Principal equipment employed included three Bucyrus-Erie Gas & Air shovels; a fleet of 5- and 7-yard dump trucks, mostly Autocars and Macks; 5 or 6 Caterpillar tractors with Ateco bulldozers and scrapers and 3 Buffalo Gas Rollers, 5, 8 and 12 tons respectively.

Job Planned to Permit Free Traffic Flow

No small part of this contract has been the planning of the job in such a way as to hamper the heavy vehicular traffic on these three streets as little as possible. Digging was started west of Peralta Street which was closed to traffic only long enough for Joe Catucci's organization to cut the ditch through the street, while the general contractor, J. F. Knapp, followed up closely with concreting which opened Peralta again to traffic before Adeline Street, a block further east, was cut through by the shovels. Thus no traffic was detoured more than a block.

San Pablo Avenue carries a far heavier flow of vehicles than either of the other streets, being the main artery for travel north from Oakland, as well as street cars to Berkeley and Albany. This street was left open while the balance of the excavation along Moss Avenue to the east was complet-

• *A Bucyrus-Erie shovel in bottom of cut. Note, back of the shovel boom, the nice sloping job done on the bank. At right center is underpass completed beneath Adeline Street.*

• The deepest part of the excavation was handled in two lifts. Here one of Joe Catucci's Gas & Airs is finishing grade, loading to a Mack truck.

ed, and finishing the second bridge, along Adeline street, opened this artery again to travel. Half of San Pablo Avenue was then cut away, traffic being permitted on the other half. As the job proceeds the half already excavated will be bridged for use by traffic while the remainder of the third bridge is completed.

Clamshell Machine Becomes Handy-man

While the material handled on this project has been easy digging for the three Bucyrus-Erie machines, the smooth progress of the job and careful sloping and grading throughout the cut are a credit to Joe Catucci and his operators. One of the Gas & Air machines, equipped with a clamshell bucket and 45′ long boom, has been used for such various jobs as handling forms, cleaning up fine grade, pulling trees, etc.

A large part of the excavated material was dumped at the ends of the cut, forming ramps to the elevated roadway toward Moss Avenue at the East End, and to a bridge over Hollis Street and the Santa Fe Railway at the West end of the job. The balance was used as part of an extensive fill which carries one of the approaches to the bridge north toward Berkeley.

• Setting forms and reinforcing for wall of underpass. Note boom of Gas & Air Clamshell in background.

Planning for Bridge Traffic a Major Task

While there is no outstanding feature as far as the excavation on this job is concerned, it is an example of the revolutionary effect on traffic flow of the San Francisco Bay Bridge. With its completion five transbay ferry routes will pass out of existence; three auto ferries, to Alameda, Oakland and Berkeley; the Southern Pacific passenger ferry to the Oakland Mole; and the Key System passenger ferry for trolley travelers. Quite aside from the remarkable engineering achievement of the bridge itself, astute city planners have had to design new routes for all types of traffic, railroad, trolley, motor vehicle and pedestrian, so that all may pass to and fro across the bridge without "bottlenecks" or traffic jams, and with greater convenience and a saving in time.

Besides the planning required in the East Bay cities, San Francisco has similar problems not only from the Bay Bridge but from its giant companion, the Golden Gate Bridge which links San Francisco with the Redwood Empire to the north. Scores of individual contracts for street widening, resurfacing, relocations, tunnels and other pieces of construction are necessary so that these two mighty bridges may best serve the entire Bay Region and Central California.

• Fine grading before laying floor of underpass is done by hand, the excess dirt being loaded by clamshell. Concrete pouring may be seen in process in background.

Asbestos Wicks for Sacred Fires

IN ROMAN times the sacred fire of the goddess Vesta burned perpetually, tended by the Vestal Virgins. The lamp wick for this vestal fire was asbestos, the same non-combustible material used today in high-temperature electrical insulation. Another historic use was for making the shrouds that covered the funeral pyres of ancient kings. The Isle of Cyprus was an early source of the fibrous mineral.

—*Westinghouse.*

Field Notes

Locating "Missing" Pipes With New Detector

A NEW magnetic detector of extreme sensitivity and accuracy has been announced by the General Electric Company. The instrument increases greatly the ease and efficiency with which distant or deeply-laid pipes can be located, according to the manufacturer. Pipe lines more than 40 years old and as far as 100 feet from their supposed locations have been found at seven-foot depths, and their exact location indicated within one diameter of the pipe.

The new detector is a surveying compass with a bar magnet for reducing the control effects of the earth's magnetic field. Affixed to the compass box, and turning with it, are two radial fins mounted on a crossbar which effect a substantial increase in sensitivity.

The detector is sensitive to iron or steel pipe lines having any magnetic bearing, at a considerable distance. It may be used with or without electric current through the pipe, although the establishment of a small current makes for easier and more certain search. Non-magnetic pipes, of course, require an electric current. Because of its great sensitivity the instrument cannot be used near trolley lines. It should be of considerable aid where drainage ditches, foundations or any other jobs where pipe or conduit may be found are to be excavated.

The procedure followed is to establish the general bearing of the missing pipe from maps and ordinary compass directions. If possible, an electric current is then established between accessible hydrants and gates, using a switch and ammeter, with a lead wire at least 40 feet from the suspected pipe line. Dry cells or an ordinary automobile battery will suffice if the line has no break in electrical continuity, but in the latter event the detector functions without current.

The detector is set up at a point known to be at one side of the pipe line, with the compass box turned to have the fins at right angles to the line. The bar magnet is adjusted to give appropriate sensitivity and also to direct the needle to have the same general bearing as the line. This adjustment is held throughout the search. In shifting stations with the detector, the compass box is turned so that the needle takes the same scale position with no current in the pipe.

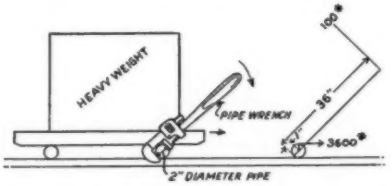
A curve is then plotted showing changes in current indication as the detector is transferred to convenient stations across the pipe line. The pipe is found directly below the peak in the curve.

When the true bearing of the pipe line is found by striking two or more courses of detector travel, then the actual depth below the detector can be readily discovered. This is done by moving the instrument over to the distant return wire, giving the wire the same bearing as that taken by the pipe line and suspending the wire over the detector at a height to duplicate the peak indications of the search curve. The distance between the wire and the compass box then equals the depth of the pipe below the compass box.

Moving Heavy Machinery

IN MOVING heavy machinery on rollers it is sometimes an advantage to use some other method than the conventional crowbar. A pipe wrench can be used on an iron roller as shown in the sketch to give considerable mechanical advantage. The ratio obtained is in proportion to the length of the pipe wrench and the size of the roller. With a 2-in. diameter pipe and a 36-in. pipe wrench the advantage is approximately 36 to one. That is by bearing down on the end of the wrench with a weight of 100 pounds it is possible to get a force of 3600 pounds to shove the machine along.

When man power is at a premium this idea will make it possible for one or two men to move a machine which ordinarily would require several. Another advantage in using a wrench is that the lever arm can be changed to suit the man working at it and he can get the best action. The wrench can be moved over a considerable arc or it can be used with short



strokes. This is a great advantage where the machine to be moved is in tight quarters where the ordinary pry can not be used effectively.

With a large ratio such as can be obtained in this way it is easy to control the motion and is especially handy when placing the machine over foundation bolts for instance. While the leverage is increased by using a small diameter pipe it will be found that the extremely small roller tends to slip easier and the rolling friction is much greater.

—*K. B. Humphrey.*

Emergency Signs from Brick Cheese Boxes

THE NEED for emergency signs and markers is frequent, and usually no special art work or craftsmanship is necessary. The prime requisite is that the sign can be easily seen, read and understood. It is not always easy to find boards of the correct size which are white enough to make good backgrounds. Oddly enough, old brick cheese boxes seem made to order for this use.

Take the box apart with some care, and tack the two sides on one of the end blocks. You will

have an area for the sign of about 4 inches by 24 inches, and the wood will be quite smooth. Heavy paint will not run on it, and the wood is white enough to afford an excellent background for crayon or heavy pencil.

—*Frank Bentley, Jr.*

Gambling on Sub-Surface Conditions

HERE is a simple business rule for excavating contractors that would have saved millions of dollars to the industry had it been closely observed in the past: Expect the unexpected and count on running into rock formations or other subsurface obstacles that are not supposed to exist. In entering into excavating contracts, *safeguard* yourself against such obstacles either by carefully exploring the site or by a carefully worded contract clause, providing for extra compensation in the event that certain classes of obstacles are encountered.

This is what happened to a bridge contracting company in California, as reported in the opinion of the California District Court of Appeal in the case of Thomas Kelly & Sons v. City of Los Angeles, 45 Pac. 2d, 223: Plaintiff contracted to build a bridge across the Los Angeles river. The plans and specifications showed that the concrete piers of the structure were to rest on pilings. Plaintiff assumed that if twenty-foot pilings were to be used the soil must be sandy or otherwise unstable, and permitted itself to be misled when its president saw that the surface was sandy and that an old bridge nearby was resting on pilings. An expenditure of $20 would have disclosed that the site was a "wolf in sheep's clothing", but the contracting company's hunch that there were no subsurface obstacles was so strong that no exploration was made.

Shortly after the work commenced, rock was encountered, but the company went ahead with the work, without asking to be let out of the contract or to have the contract modified. It contented itself with assurance given by the city's inspector and engineer that extra pay would be allowed.

But the Court of Appeal ruled that the Company was bound to know that city inspectors and city engineers do not usually have power to bind municipalities by altering the terms of construction contracts—a power ordinarily committed to city councils or kindred bodies.

Furthermore, when the court went through the contract with a fine-tooth comb—which the company should have done before signing it—it found several provisions that prevented the company from relying upon an assumption that Mother Nature had not hid any boulders in the path of the bridge pilings. First, the contract said that no information derived from the map, plans, specifications, etc., covering the job should let the contractor out of any risk or obligation to carry out the contract. Then, there was another clause requiring the contractor to make all necessary excavations, including "The removal of all water and other materials or obstructions of whatsoever nature encountered". And the court confronted the contractor with a clause in the instructions to bidders, requiring them to satisfy themselves as to all local conditions affecting the work, etc.

So, the company lost its claim of more than $11,000 for extra compensation.

—*Arthur L. H. Street,*
Attorney-at-Law.

Handy First-Aid Kit

A CANVAS belt or pocket kit, measuring 4" x 3" x 2" and weighing only 10 ounces, contains complete first aid treatment for snake bites and common injuries encountered by those outdoors. The kit was developed primarily for use by workers in petroleum fields, foresters and construction crews, whose tasks take them into snake-infested territories. Often such workmen are far distant from hospitals.

The snake bite kit contains everything required for proper first aid treatment in accordance with modern medical recommendations. An antiseptic bottle is handy for treatment of wounds and bruises. The first aid kit contains an assortment of dressings and treatments most frequently required. All units in the snake bite first aid kit are unbreakable. The antiseptic is supplied in a break-proof container.

Descriptive circular may be obtained free from the manufacturer, E. D. Bullard Company, 275 Eighth Street, San Francisco.

Oiled Berms Save Embankments

IN DRY regions, where highway fills are built up of sandy soil, the embankment is easily carried away by the runoff from even a light rain. In southern California highway crews prevent this by building up berms,

to a height of 8 or 10 inches along the edge of the embankment, then covering them with four to six inches of oiled surfacing, which is usually obtained by plowing up and pulverizing an abandoned section of road. A spillway is made in the embankment at intervals of about 200 ft. and this is treated with the oiled surfacing also. An advantage of these spillways is that they may be adapted in shape and length to the particular part of the embankment where they are made. This method is used between Yuma, Arizona, and the sand hills in California, on highway 99. —*J. C. Coyle.*

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F. O. WYSE
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ARNOLD ANDREWS
Editor

D. B. REED, JR.
Assistant Editor

A. R. TOFTE
Assistant Editor

E. M. HEUSTON
Advertising Manager

The Business Situation

THERE recently came to our attention a statement from the Cleveland Trust Company which is so pertinent in view of the election ahead of us that we quote it in full below. The factual information it contains may well serve as a valuable yardstick in measuring the business interpretations which will assail us.

"During the political campaigns that are now getting underway numerous statements will be made . . . because of this it seems worth while to review the latest official figures of the general business indexes published by the Federal Reserve authorities, and to interpret them as simply as possible. The latest data are those for April of this year.

"The general business indexes are stated in terms which take their averages for the years 1923, 1924 and 1925 as being equal to 100. The first of those three years was one of general business prosperity, the second one of mild depression, and the third a year of moderately good times. The federal authorities really assume that an index of 100 in those three years taken together represented normal conditions for business activity as a whole, although it probably represented distinctly more than normal conditions in building construction. Since that time our population has grown by 13 per cent so we shall not be much in error if we consider 113 to be normal now for the official statistics if we remember that we are most conservative in assuming that no general progress in our living standards should have been made in the past dozen years.

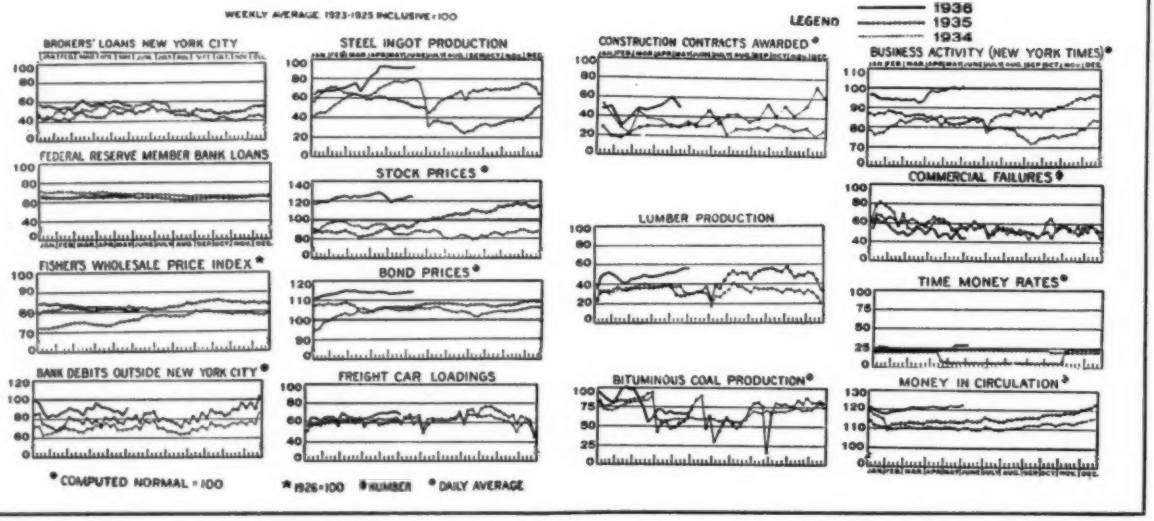
"On this basis the April figures show that the volume of industrial production was 12 per cent below the normal level. The value of all construction contracts was 58 per cent below normal, while that of residential contracts was 74 per cent below normal. These construction figures are probably low because the base from which they are measured was abnormally high.

"Factory employment in April was on this same basis 25 per cent below normal, while factory payrolls were 31 per cent under normal. Freight car loadings were 39 per cent below normal, and department store sales 28 per cent below. Export trade should be added to this list although it is not one of the Federal Reserve general indexes. For the first four months of this year it is about 48 per cent below normal. The average of these seven indexes, other than residential construction, is 34 per cent below normal.

"Both business activity and the security markets will be moving in advancing trends during the second half of this year if they follow the courses marked by their averages in the election years of the past century. This bank has among its long diagrams of business activity one which shows the course of stock prices by month since 1831. In the very earliest years the stocks used in the index were those of canal companies, but from 1883 onward they were those of railroads. By using these data it is possible to construct a diagram showing the average of the movements of business activity above and below the normal or 100 per cent level, and the average of the rail stock prices for all the election years since 1832 when President Jackson was reelected.

"The diagram will show an advance into February, a decline from then to July, and then an advance to the end of the year.

WEEKLY BUSINESS INDICATORS



The average of stock price movements advances to April, declines rather sharply to June, and then has an uninterrupted advance to the end of the year.

"These average records are important because there is widespread interest in their subject matter, and because they have some historical value. Nevertheless they should not be interpreted as being of much usefulness as guides to show the probable movements of business and stock prices in any one particular election year. During the long period covered by the records the data for individual years have followed most diverse courses, and in many instances have not conformed at all closely to the orderly patterns.

"It may well be that there has generally prevailed among business men during the election years of the past century something of cautious and hesitating sentiment regarding business prospects as the time for presidential nominations approached, and that attitudes have usually become more confident after the nominations have been made. The diagram would support such an interpretation. It is interesting to note that the low points for both business activity and stock prices are near the middle of the year instead of being in the election month.

"Business activity as reflected by the volume of industrial production made good progress in April, and has been holding its gains well since then. The index of production computed by this bank from the data of the Federal Reserve index stood at 12.2 per cent below the computed normal level in January. It dropped to 16 per cent below in February and to 17 in March. Then it made a sharp advance to only 11 per cent below in April. This figure is still a preliminary one. The estimate for May shows almost no change from April, and stands at 10.9 per cent below normal."

Cyrus H. McCormick

CYRUS H. McCORMICK, retired chairman of the board of directors of the International Harvester Company, died June 2 at his home, "Walden," in Lake Forest, Illinois, where he was stricken with a heart attack.

Mr. McCormick was a principal factor in the formation of the Harvester Company in 1902 and its president from that time until 1918 when he became Chairman of the Board, which office he held until his retirement.

He was born in Washington, D. C., May 16, 1859, the eldest son of Cyrus Hall McCormick, inventor of the reaper, and Nancy Maria Fowler McCormick. He attended the Chicago public schools and entered Princeton University as a member of the class of 1879. After college he entered the McCormick Harvesting Machine Company, of which his father was the head. The business career which long ago established Mr. McCormick as one of the world's foremost industrial leaders began with this association with his father. In 1884 the son succeeded to the presidency of the McCormick Company.

In 1902 the McCormick Company united with others to form the International Harvester Company, and Mr. McCormick was elected the first president.

During his 33 years as president and chairman of the Harvester Company Mr. McCormick pioneered many activities in the Harvester organization which have borne abundant fruit in their application to industry.

Conspicuous among these policies forwarded under Mr. McCormick's leadership were effective organized safety movement; voluntary compensation for workers injured in the course of duty, the plan set up for this purpose being taken as a model for the earlier state legislation on this subject; a voluntary system of pensions for veteran employees which was wholly supported out of the company funds; a wide development of new types of farm machinery that has spread low cost and efficient implements throughout the agricultural world; a highly developed plan for appointing executives from among worthy men in the ranks; and above all a policy of industrial relations based on a system of employee representation known as the Harvester Industrial Council Plan.

Mr. McCormick was married at Monterey, California, March 5, 1889, to Harriet Bradley Hammond. They had three children, Cyrus, Elizabeth and Gordon. The daughter died in childhood. In her memory was established the Elizabeth McCormick Memorial Fund which has pioneered many worthy works for children. Mrs. McCormick died January 17, 1921. As a memorial to her Mr. McCormick built and equipped the Harriet Hammond McCormick Memorial building at the corner of Oak and Dearborn streets, Chicago, now owned and operated by the Y. W. C. A. On April 22, 1927, Mr. McCormick was married a second time to Alice May, daughter of Jeremiah P. Hoit, of Chicago.

James H. Williams

JAMES HUNTER WILLIAMS, well known for many years in the commercial lime and lime rock road material industry, died on May 6, at the age of 58.

A native of Florida, Mr. Williams and W. M. Palmer in 1917 formed the Commercial Lime Company of Ocala. In 1924 he was one of the founders of the Dixie Lime Products Company, organized to produce road base material. The success of this material led to the establishment of the Georgia Lime Rock Company with three plants in that state.

Mr. Williams was president of the Commercial Lime Company and the Georgia Lime Rock Company, and vice president of the Dixie Lime Products Company. His death brings a deep sense of sorrow and loss to his many friends and co-workers.

EQUIPMENT
You Ought to Know About

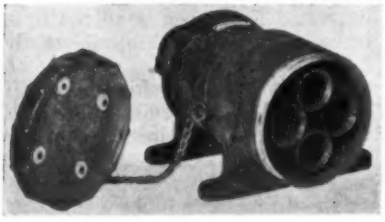
New Portable Cable Accessories

INCREASED use of portable electric equipment has brought a widespread demand for satisfactory methods of connecting and terminating portable cable. In recognition of this need the General Electric Company has announced a line of portable cable accessories which includes high-voltage cable couplers and molded terminals for all voltages. These new cable products are designed to incorporate safety, long wear, and convenience in the field.

For use on high-voltage cable applications the General Electric Company offers a newly designed coupler. These couplers can be used to provide a satisfactory method to connect apparatus and to connect lengths of portable cable together.

The couplers, which are rated at 100 amperes, are particularly adapted for use with G-E 2500-, 3500-, and 5000-volt, Types SH and G, portable cables. Provision is made in the coupler socket so that the shielding tapes or ground conductors of the cable can be brought out for grounding purposes.

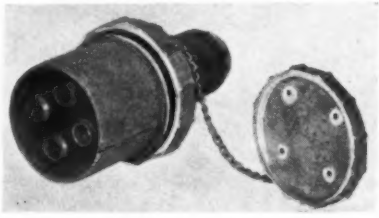
Both the socket and plug are equipped with a cover to prevent the entrance of dirt and moisture when the coupler is disconnected.



The coupler socket and plug are made of a malleable-iron frame with a malleable-iron end bell, which is bolted on. The current-carrying contacts are the sliding-spring type and are enclosed and shielded by Herkolite tubing. There are four contacts, three of which are for the individual conductors of a three- conductor cable; the fourth contact is for the shielding braid or ground wires.

That the coupler may be used as a connector between cable lengths, the end bells have been made interchangeable so that the plug-end bell may be put on the socket end in place of the socket-end bell and flexible connections made at each end of the coupler.

The new General Electric molded-rubber terminal will prove well adapted in cases where it is desirable to terminate portable or drag cable at the source of energy or at the load by means of a terminal which will hold the single conductors firmly together as a unit. The terminal is made of G-E R-387 tellurium compound and provides means of properly terminating ground wires and



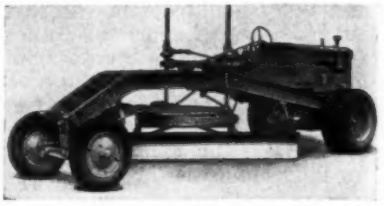
braided shields so that they can be correctly grounded. The additional cost of applying terminals is very slight.

New "Caterpillar" Diesel Auto Patrol

THE latest addition to the Caterpillar Tractor Company's line of road machinery is the No. 10 Diesel Auto Patrol, the second road maintenance machine in the Company's line with a compression ignition engine. The new unit is powered with the same 4 cylinder, 4 cycle Diesel engine used in the RD4 tractor. This power plant, with a 4¼-in. bore and 5½-in. stroke, develops 44 horsepower at governed speed of 900 r.p.m.

The new model is available with either tandem or single drive, according to the announcement. 7.00-20 tires are standard equipment on the front wheels and 11.25-24 low pressure tires are furnished on the rear wheels of the tandem drive model while the dual rear wheels of the single drive machine carry 9.00-24 tires. 12-foot blades are standard equipment on both machines.

Full power control, which has long been an important Auto Patrol feature, is retained in this latest model. All operating controls of the blade and scarifier are accomplished through power control levers grouped directly in front of the upholstered operator's seat.



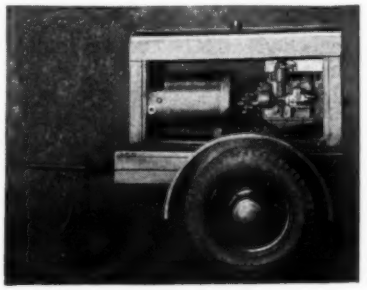
With the announcement of the No. 10 Diesel Auto Patrol, the larger machine formerly known simply as the Diesel Auto Patrol becomes the No. 11 Diesel Auto Patrol. Spark ignition as well as Diesel models will continue to be available in both sizes.

The new No. 10 Diesel machine weighs approximately 15,600 lbs. in the tandem drive model and 13,000 lbs. with single drive. Both models are provided with four speeds forward and one reverse, the forward speeds ranging from 1.8 to 10 miles per hour.

New General Utility Welder Powered by Air-Cooled Gasoline Engine

THE MODEL W-150, an entirely new P&H-Hansen arc welder of 150-ampere capacity is designed to cover a broad range of welding jobs according to Harnischfeger Corporation, Milwaukee, the manufacturer.

It will handle bare or coated electrodes from $\frac{3}{32}$" to $\frac{3}{16}$" for welding materials of varying thicknesses. Welding is simplified



through single current control accomplished by shifting brush holders for current settings over the entire welding range.

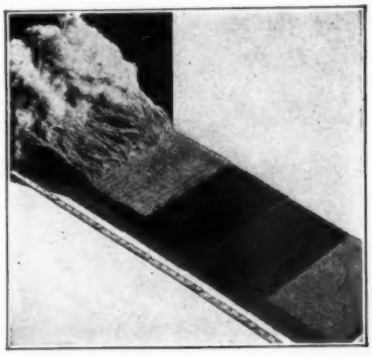
Gatke Deep-Well Woven Brake Lining

AN IMPROVED woven brake lining is announced by the Gatke Corporation, developed especially for severe service conditions to afford safer handling of excessive loads and eliminate brake flange wear.

The highest grade asbestos spinning fibre is used, from which every particle of abrasive rock dust has been removed by a special Gatke process. To provide additional protection against scoring, soft zinc alloy wire is combined with the abrasiveless asbestos fibre. Tremendous looms, built especially for the purpose, are used to weave the material into a unified mass with no layers to strip or peel.

This tightly woven material is thoroughly saturated with a special high-heat-resisting frictional compound of infusible resins. The unique combination of asbestos spinning fibre, zinc alloy wire and this special frictional compound affords tremendous tenacity yet uniform and smooth release under all operating conditions.

Baking, calendering and hydraulically compressing forms the material into a dense, compact structure that is impervious to oils, water and grease, has long wearing qualities, and sufficient flexibility to conform with various brake flange diameters.

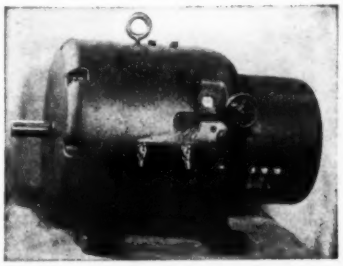


This new type Woven Brake Lining is made in all sizes up to 14″ wide by 1¼″ thick and is recommended by the manufacturer for all industrial uses where severe service and high temperatures are encountered.

New Belted or Coupled Welding Generator

BASED on their newly developed cross-field principle a new welding generator for belted or coupled welding sets with a novel control system producing superior arc quality and eliminating rheostat, resistors, meter, reactor and exciter required in conventional designs, is announced by Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. Due to its design the welding current is unaffected by the ordinary speed variations of the driving unit.

The new 200, 300 or 400 ampere generator with a new system of control allows the operator to adjust the generator to give the welding current required before the set is started, thus eliminating the trial and error methods usually used. This control of the welding current is accomplished by purely mechanical means which vary the armature reaction fluxes of the generator.



This control is continuous, without steps, and permits minute changes in current adjustment. A polarity reversing switch is provided for instantly changing the polarity of the electrode as required by different electrodes, without changing the cable connections.

Elimination of the exciter makes it possible to use an exceptionally short and heavy shaft which greatly minimizes possibility of vibration. The shaft runs on ball bearings which have a new and unsually effective seal.

The generator is enclosed in a rugged shell of drip proof construction with four solid machined feet. Two ball bearings are provided, one at either end. A drip cover over the commutator is removable to permit access to the brushes.

New Stopehamer Uses New Principle of Rotation

INGERSOLL-RAND has recently announced a Stopehamer that is faster and more powerful than any Stopehamer previously built by them.

The new tool makes use of an entirely different method of rotating the drill steel. The customary pawls, pawl-springs, and ratchets are no longer used.

A reciprocating motion is imparted to the rifle bar by the movement of the piston, assisted by air pressure applied alternately to the faces of the rifle bar head.

When the piston moves forward, the teeth of the rifle bar are actually lifted out of engagement, and the bar is rotated freely. When the piston reverses the teeth are forced back into engagement in an advanced position. The returning piston is rotated by the helical flutes of the locked rifle bar, causing the steel to rotate.

The rifle bar teeth can be held out of engagement by air pressure controlled by the throttle valve. Thus hammer action without rotation is available for collaring a hole.

This pneumatic "on-off" control without extra levers or buttons is made possible by the new rotation principle.

The new Stopehamer is made in two sizes designated "SAR 120" and "SAR 85." Both are unusually light in weight and low in air consumption, according to the manufacturer.

Lincoln Announces New Electrode For Welding Bronze, Brass and Copper

A PHOSPHOR BRONZE arc welding electrode "Aerisweld," recently announced by The Lincoln Electric Company, Cleveland, is said to provide a solid homogeneous deposit, having characteristics of true phosphor bronze with notably high tensile strength, for the welding of bronze, brass and copper in many applications.

The high quality weld metal produced by the electrode makes it ideal for fabricating new products or reclaiming old ones of bronze, brass or copper. A few of the many applications include: impeller blades in pumps and turbines, bushbars, large contacts, etc. For complete information write The Lincoln Electric Company, mentioning Excavating Engineer, please.

CONTROL means

Water power ... *out of control* ... can be one of the most destructive forces known to man. Homes, property, human life—all are swept away with fiendish abandon. But *under control* ... water power brings the cheery comfort of heat and light to millions. CONTROL MAKES THE DIFFERENCE.

(*Right*) Control makes a difference in tractors, too. Note the absolute freedom of slippage, as shown by tracks in the sand—the result of BALANCE. This Model "K-O" and bulldozer keep fine, shifting sand from blowing back into California's All-American Canal.

Controlled Ignition

ELIMINATES THESE COSTLY PROFIT ROBBERS:

- **High Tension Rings**
- **Special High Pressure Bearings**
- **Heat Reservoirs In Combustion Chamber**
- **Special Lubricating Oil**

ALLIS-CHALMERS

TRACTOR DIVISION—MILWAUKEE, U. S. A.

Controlled Ignition PERMITS PROPER BALANCE BETWEEN POWER AND WEIGHT

ALLIS-CHALMERS Oil Tractors are "trained down" to fighting weight. Light-footed . . . responsive . . . quick-acting—a pleasure to operate, a revelation in performance. The exclusive *Controlled Ignition* principle does away with the extra dead weight which cuts down speed, wastes power, and slows up production. Such familiar penalties of high compression ignition as heavy, unbalanced parts, special heavy construction and auxiliary starting devices are no longer necessary. Once again Allis-Chalmers leads the way—this time to give you maximum economy on Diesel fuel oil, combined with simplicity, smoothness, better balance, greater flexibility, easier servicing, instant starting, lower first cost. Branch house and dealer service everywhere. Ask the A-C dealer.

• • •

CONTROLLED IGNITION OIL ENGINES—INCLUDING FUEL PUMPS AND INJECTORS—ARE OF ALLIS-CHALMERS OWN DESIGN

CONTROLLED *Instant* STARTING

Easy starting, regardless of weather. Crank or self-starter. No auxiliary starting motor.

CONTROLLED INJECTION OF FUEL

Diesel fuel oil is sprayed (not squirted) into the combustion chamber at 60° before top dead center. Fuel pump of A-C design . . . measures charge of fuel accurately, regardless of load or throttle setting. Simplest, easiest to service fuel pump built. Controlled pressure in fuel lines — no hammer-like blows from pressure changes.

CONTROLLED AIR-FUEL RATIO

Specially designed injection system maintains proper ratio for efficient combustion at ALL engine speeds. No excess of air at idle speeds to lower exhaust temperatures at the expense of power.

CONTROLLED IGNITION

Controlled spark ignition at exactly the proper point for complete, efficient combustion. No chance of power-wasting pre-ignition. High compression pressures with the resulting destructive forces are eliminated. No need of special rings, or heavy, unbalanced parts. No split-hair tolerances.

Again ALLIS-CHALMERS LEADS THE WAY

ntrolled Ignition OIL TRACTORS

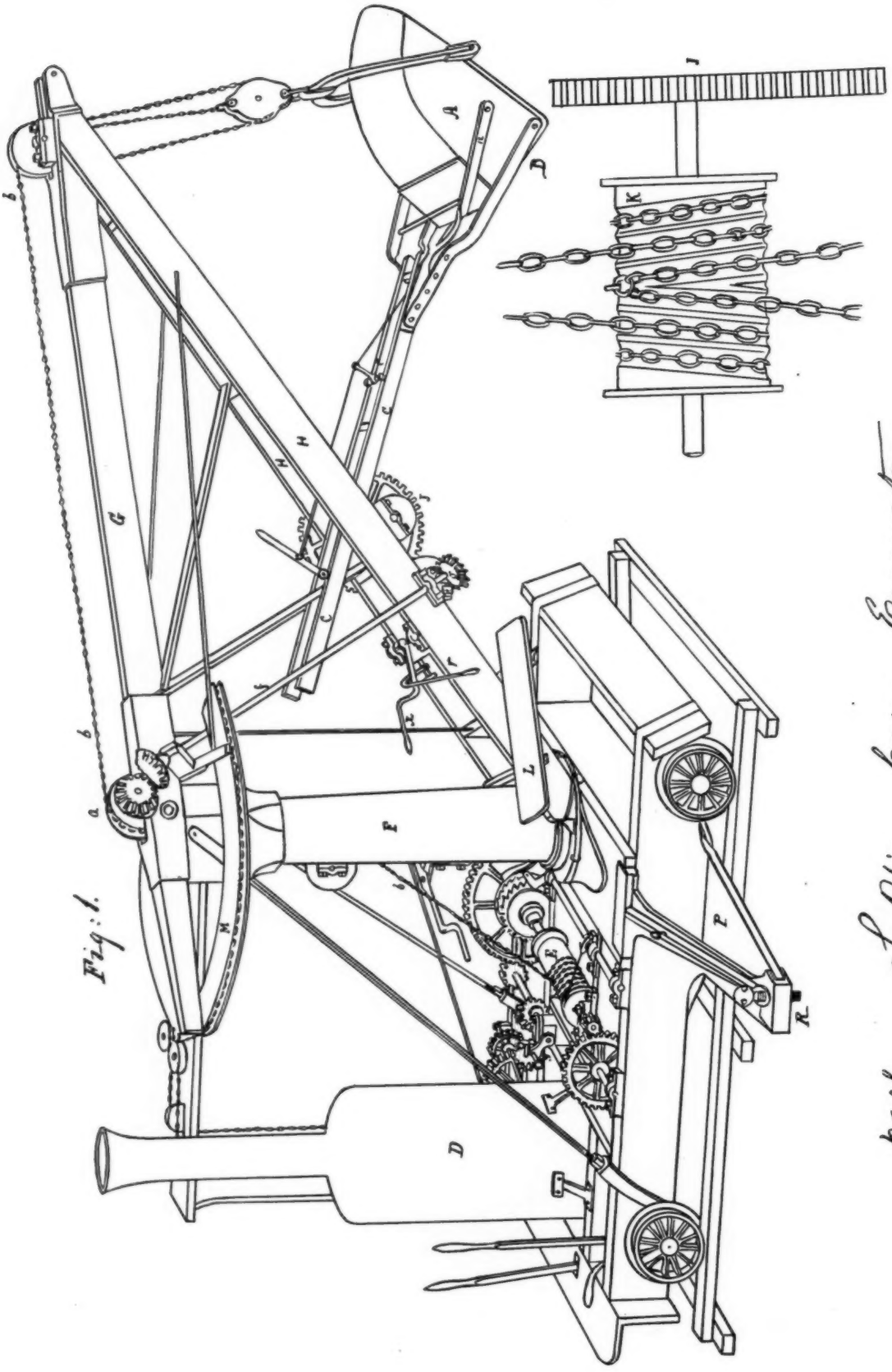
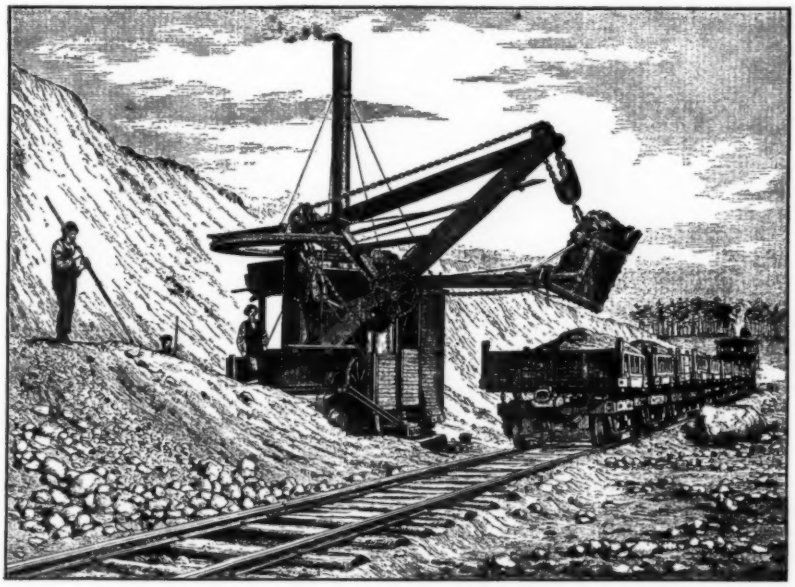


Fig: 1.
William J. Otis Crane Excavator
Patented 24 Feb. 1839

Digging by "Stame"

An Old Timer talks about the Otis. . . . A day on an Early Railroad . . . Conclusion



• *The illustration reproduced above was used on the cover of a catalog issued by John Souther & Co., probably in the late 60's or early 70's.*

***By* WILLIAM ELLISTON FARRELL**

(Copyright, 1936, by William Elliston Farrell)

This is the fourth and final installment of Mr. Farrell's history of the origin and early development of the steam shovel. The story began in the April Excavating Engineer.

HAVING read the first installment of "Digging By Stame," Sweney Munson, old time shovel man, sent us the following first-hand account of a railroad job on which an Otis-type machine was used.

"Prior to 1881 all traffic on the C. B. & Q. Railroad was ferried across the Missouri River, east of Plattsmouth, Nebraska. In 1880 a bridge was started across the Missouri at that point, and was finished in 1881.

"The West approach of the bridge butted up against a hill about 80 feet high, but sloped sharply to the North. A sharp curve from the approach of the bridge was made towards the North-West, and the cut for the curve was taken out with teams and wasted to the North. In the meantime the bridge was being built across the river, and a trestle 2000 feet long, and 20 to 30 feet high was built as the approach to the bridge from the East side. This trestle was afterwards filled in with dirt taken from the west side of the river.

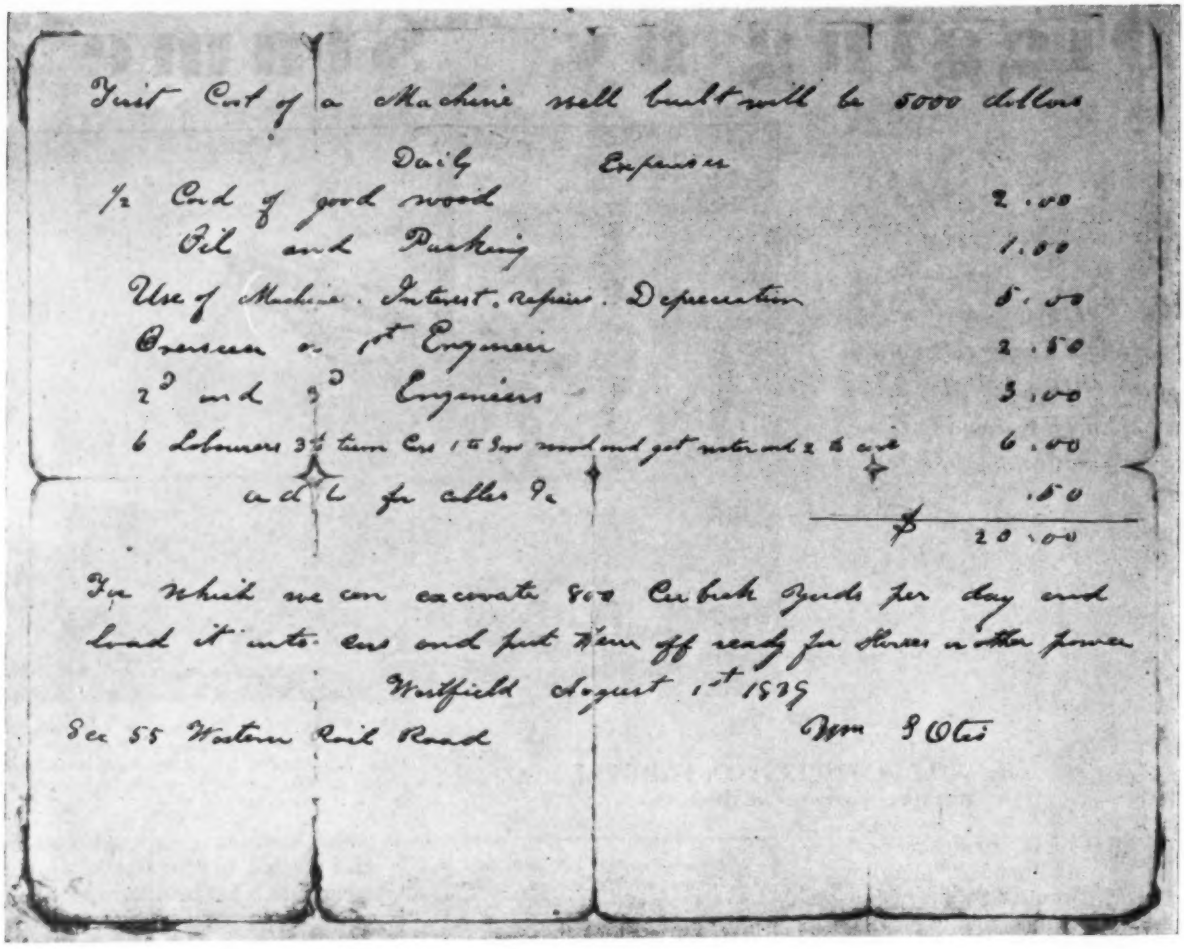
"As soon as the bridge was finished, a track was laid from Plattsmouth, through the cut, over the bridge and trestle and connected with the C. B. & Q. at Pacific Junction, Iowa. A side track was now laid on the south side of the main track in the cut, and chutes were built to carry the dirt down to flat cars on the side track, the dirt was then hauled across the bridge and plowed off with a locomotive and a long cable, and believe me that was some job of plowing. A lift of about 40 feet had been taken off by the teams, when they withdrew and an 'Otis' steam shovel was put in to finish the cut, which it did.

• *The job Sweney Munson tells about involved 236,647 yards of dirt excavated at a flat price of 24½ cents per yard. Contractor was S. D. Eaton of Burlington.*

• *On the opposite page is a reproduction of the drawing, hitherto believed lost, which accompanied Otis' restored patent application. It is undoubtedly the oldest drawing of a steam shovel in existence. The original is in the possession of the Canton Historical Society, Canton, Mass.*

Digging to Dance Rhythm

"This machine looked just like the Schumacher picture shown



Just Cost of a Machine well built will be 5000 dollars

Daily Expenses

½ Cord of good wood	2.00
Oil and Packing	1.00
Use of Machine. Interest. Repairs. Depreciation	5.00
Dresser or 1st Engineer	2.50
2d and 3d Engineers	3.00
6 Laborers 3 to turn Cts 1 to 3 to mend and get water and 2 to ave	6.00
and 6 for cable 9c	.50
	$ 20.00

For which we can excavate 800 Cubic Yards per day and load it into cars and put them off ready for stowing in other forms

Westfield August 1st 1839

Wm S Otis

Sec 55 Western Rail Road

on page 178 in the April Excavating Engineer. The operator stood way back on the right side of the boiler, where he could not see the dipper very well in the pit, so he had to depend on the craneman to tell him when to dig and when not to dig. The craneman had two levers to handle, one to crowd the dipper in and one to hold the dipper out when swinging, and it was comical to see him giving signs with his feet to the operator. To dig he would put his foot down on his toe, to swing right he would move his right foot to the right, and he would swing his left foot when he wanted the operator to swing to the left. That craneman was quite busy dancing a jig when the machine was digging; nevertheless, he got the job done.

"I was night-watchman on the bridge, and many times I would go to the job early and spell the fireman awhile, because the boiler was not a very good steamer and so was hard to handle.

"I don't remember the operator's or the craneman's names, nor do I remember if it was a company job, or a contract job, as those things did not interest me at that time. But I do remember that it was said to be the biggest steam-shovel job in the country, and I think it was, because an immense amount of dirt was moved."

• *According to this expense account in Otis' handwriting, his shovel loaded for a little less than 2½ cents per cubic yard on this job.*

EXCURSION TO PHILADELPHIA, AND REMARKABLE PERFORMANCE OF THE LOCOMOTIVE "GEORGE WASHINGTON"

As has been said, so very meager is any personal information regarding Wm. S. Otis that it seems worth while to quote from records showing how he spent one day, July 19, 1836, during the construction of the first shovel, as the guest of Eastwick and Harrison. The quotation will further serve to illustrate the times in which he lived.

"In pursuance of our request, Mr. Norris made arrangements with the Commissioners of the Columbia Railroad, for the use of his locomotive.

"Tuesday, July the 19th, 1836, was the day appointed for the trial.

"We left here on Monday afternoon, at 4 o'clock, accompanied by Mr. George N. Miner of this city, Mr. Theo. Schwartz of Paris, and Messrs. Elliott and Beats, of Alabama, Mr. S., who was to sail for Europe the next day, gladly made the trip, with a view to carry home his own testimony as an eye witness.

(Continued on page 372)

Let's Look at Cordeau -- for *Giant Blasts, et cetera*

What do we mean by "et cetera"? Anything from giant blasts to single shots, with well drill, wagon drill or jackhammer holes; pocket, tunnel and broken loads; mud capping, demolition, ditching, and submarine . . .

Look at Cordeau Bickford Detonating Fuse *for better blasting.* Maybe you can use it profitably.

1. ***More work from explosives*** because the line of Cordeau acts as a detonator for *each* cartridge in the hole. The detonating wave is carried by the Cordeau.
2. ***Less hazard*** because Cordeau is an insensitive detonator—a lead tube filled with TNT. It must be detonated: ordinary shocks do not affect it.
3. ***Simplified loading*** because no primers are needed in the loads.
4. ***Better fragmentation*** because the Cordeau hook-up can be planned to fire each hole in rotation. *The time interval is infinitesimal,* yet it serves to *relieve burden.*
5. ***Equipment moved less often*** because drilling can be completed and all shots fired as a single blast—with Cordeau. When drills, pipe lines, compressors, scrapers, shovels and clearing gangs can be left in position until their work has been completed, we have a decided saving in time, labor and equipment.

Send for a copy of the Cordeau Book. There is no charge.
THE ENSIGN-BICKFORD CO., Simsbury, Conn.

CORDEAU
DETONATING FUSE
BICKFORD
ALSO SAFETY FUSE *Since* 1836

THE ENSIGN-BICKFORD COMPANY

CB-49

For your convenience in writing The Ensign-Bickford Company, you will find a card bound in this issue.

SHOTS *from the Firing Line*

Bureau of Reclamation Work Reaches New Peak

SEVENTEEN major contracts for a total of $1,551,418.65 were awarded during May in connection with the Bureau of Reclamation Construction program which rose to an all-time peak. In reporting the month's activities, John C. Page, Acting Commissioner of Reclamation, said that good progress was being made all along the line.

The list of contracts let during May included three important new construction jobs. The largest of these was the contract for the construction of Caballo Dam on the Rio Grande in New Mexico, which was awarded to Mittry Brothers Construction Company on its low bid of $857,018. Another was the contract for construction of a railroad and a highway bridge and a wash crossing structure on the All-American Canal, which went to David H. Ryan of San Diego on his low bid of $155,447. The third was for construction of the O'Keefe wasteway and other work on the Frenchtown Project in Montana, which went to Ralph Davis of Conner, Montana.

Several important contracts were pending at the close of the month, and bids had been called for more than a dozen additional jobs of importance.

"This summer will be the busiest in our history," Mr. Page said. "We have 16 dams under construction. Bids have been called on two others, and six more are being designed preparatory to a call for bids. Two dams, the Hyrum dam in Utah and the Agency Valley dam in Oregon, both undertaken since the emergency program was launched in 1933, have been completed this year and are now in service.

"These dams and the reservoirs they will create will be of tremendous service to the people of the far west through future years. Our construction, of course, is not confined to dams, but they are the key structures in any reclamation development since it is by them that the water supply is conserved."

The present status of dams now under construction by the Bureau is as follows: Boulder Dam and Power Plant, 99 per cent complete; Grand Coulee Dam, 50 per cent complete; Parker Dam on the Colorado between Arizona and California, 5 per cent complete; Imperial Dam on the Colorado, the diversion dam for the All-American Canal, just started; Seminoe Dam of the Casper-Alcova project on the North Platte River in Wyoming, 5 per cent complete; Alcova Dam on the same project, 29 per cent complete; Rye Patch Dam on the Humboldt River in Nevada, 99 per cent complete; Island Park Dam of the Upper Snake River project in Idaho, 10 per cent complete; Pine View Dam on the Ogden River in Utah, 67 per cent complete; Moon Lake Dam in Utah, 30 per cent complete; Taylor Park Dam of the Uncompahgre project in Colorado, 25 per cent complete; Hamilton Dam, Colorado River of Texas, construction just resumed; Unit Dam, Burnt River project, Oregon, just starting; Bull Lake Dam, Riverton project, Wyoming, 5 per cent complete; Alamogordo Dam of the Carlsbad project in New Mexico, 6 per cent complete; the Caballo Dam, contract let in May.

Bids have been received and are being studied in connection with the Arnold Dam and Bartlett Dam.

The six dams now being designed include the three of the Central Valley project, the Fresno Dam of the Chain of Lakes project in Montana; Boca Dam on the Little Truckee River, and the Deer Creek Dam of the Provo River project.

Highway Bill Signed

ON JUNE 16, the President signed the Hayden-Cartwright Bill, providing Federal-Aid for highways for the two fiscal years ending June 30, 1939. Authorized expenditure for the two years is $476,000,000. Funds for each year are apportioned as follows:

$125,000,000 regular federal-state highways
$50,000,000 grade crossings
$25,000,000 secondary and farm-to-market roads
$14,000,000 forest highways and trails
$2,500,000 roads through public lands
$7,500,000 national park roads
$10,000,000 parkways and connecting stations
$4,000,000 Indian reservation roads.

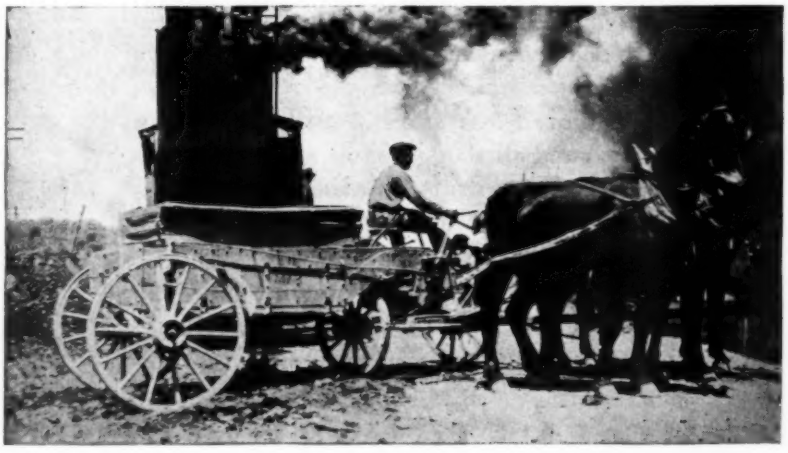
With the matching $300,000,000 which must be provided by the states, a total of $776,000,000 will be available for the 1938—1939 highway program.

Rip-Rap Rock for Fort Peck Dam

A CALL for bids has been issued by the District Engineer at the Fort Peck for quarry stone to be used to cover the upstream face of the Fort Peck Dam as protection against the action of ice and waves. Bids will be opened at Fort Peck on July 7th, 1936. Award will be made to the bidder who can furnish suitable rock at the lowest delivered cost (f.o.b. Wiota, Montana) to the government.

Three classes of stone are listed in the specifications: Class A stone—3 to 7 tons in size for each piece, with an estimated quantity of 229,000 solid cubic yards: Class B stone—1 to 5 tons in size with an estimated quantity of 308,000 solid cubic yards; Class C stone (spalls)— 25 to 150 lbs. each, quantity 228,000 solid cubic yards. The total quantity involved is about 765,000 cubic yards. The quantities given above are for Type Y Stone (4455-4725 lbs. per cubic yard). If the stone is lighter or heavier than the limits indicated, a greater or less yardage will be required.

Detailed specifications cover the quality of the rock which will be called



• *Owned by the state highway department, this Bucyrus-Erie steamer is working on Highway 23, near Big Stone Gap, Virginia. Most of the manual work on the project is handled by prison labor. The age of the hauling equipment doesn't seem to bother the gentleman in the driver's seat— or the motive power, either.*

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		A-W	Any other
1	Three-wheel design places maximum weight over the plow and prevents tipping regardless of soil hardness	1	
2	Hydraulic stiff leg forces the plow down any required depth and holds it there even in hard ground. The weight of the grader added to plow beam weight makes this stiff leg action practical	1	
3	Standard plow disc increased to 32" diameter, 30% larger than 28" plow recommended for other machines	1	
4	Elimination of left front wheel permits grader to cut farther into the bank	1	
5	A furrow gauge wheel lets operator control width of the cut by hydraulic control from platform	1	
6	Plow beam is arched to prevent choking	1	
7	Plow and plow beam can float when conditions favor conventional work	1	
8	Carrier is troughed to carry more dirt on 48" belt and eliminate sideboards which set up friction	1	
9	Automatic belt tension prevents slipping	1	
10	Carrier built of alloy steel for light weight and strength	1	
11	Three-wheel design keeps all wheels on the ground regardless of uneven surface and eliminates all strain on frame members	1	
12	Austin-Western hydraulic controls raise or lower carrier, control depth and width of cut	1	

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Check these 12 features against any other elevating grader you ever heard of. Write in any advantages we may have missed—add up the two columns and see who wins.

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upon to withstand the severe action of the elements. Various locations are listed where rock of suitable quality may be found, although bidders are not restricted to the sources listed.

A railroad will be constructed by the government to the vicinity of the quarrysite of the successful bidder. The contractor receiving the award will be required to commence development operations at the site selected by him within 10 days after he receives a formal notice to proceed. Three priorities are included with deliveries starting on the first priority within 30 days after completion of railroad facilities. Deliveries under this priority will not exceed 1,000 solid cubic yards per day. In order to enable quarrying operations to be continuous, rock produced in excess of requirements at the dam may be placed in storage piles by the contractor.

It is contemplated that, due to severe weather during the winter, work of placing stone at the dam may be suspended during the more adverse conditions, with result that there may be lapse of time between deliveries under the three priorities.

The presence of a well-equipped government testing laboratory at Fort Peck will facilitate the determination of the bidder to be awarded the contract, and later, will expedite operations in the field by furnishing reports on the quality of the materials quarried without delays attendant on shipment of samples to distant laboratories.

New York World's Fair Contract

THE grading contract for the site of the world's fair, to be held in New York in 1939, has been awarded to Arthur A. Johnson and the Necaro Co., Inc., on their combined bid of $2,186,185. The contract calls for moving 7,000,000 cubic yards of fill, the work to be completed by April 1, 1937.

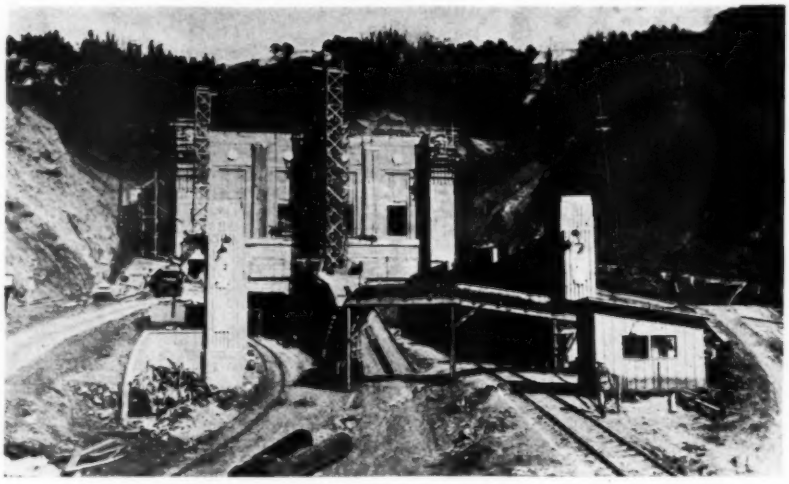
$3,684,000 Tunnel in California

By C. W. Geiger

DESIGNED to provide a highway route from Oakland and other East Bay Cities to the Contra Costa suburban region east of Berkeley Hills, the Broadway low level tunnel, on which Six Companies, Inc. began work late in 1934, involves over 1,000,000 yards of excavation and grading.

The tunnel is composed of twin bores, 15 feet apart at the portals, and 100 feet in the middle. Each is 35 feet out to out by 34 feet high, and lined with two to five feet of concrete. Between portals, the bores are 2910 feet long, and each contains a 22-foot roadway and a three-foot sidewalk.

After excavating the west portal approach cut, retaining walls, drainage system and portal masonry were placed. Tunnel driving started with eight-foot side drifts on the outside perimeter,



• *West Portal of the Broadway low level tunnel near Oakland, California. The concrete building houses an electric fan system supplying pure air for the 2910-foot twin bores.*

and was followed by arch excavation and core removal. Excavated material was hauled in five-yard muck cars drawn by electric storage battery locomotives and dumped in the highway embankment 3,000 feet west of the approach cut. The concrete lining closely followed the face excavation, drill carriages and forms having been designed to enable continuous operation. Forms are in 40-foot sections, one operating in each bore.

Powerful lights every 15 feet will provide excellent illumination. An outstanding feature will be light transition structures at each portal to aid the eye in adjusting itself quickly to the difference between natural and artificial light. Resembling overhead venetian blinds, these structures are about 200 feet long. They will admit light equivalent to a north, daylight exposure without sun.

Ventilation will be handled by an electric fan system. Eight fans in the portal buildings will pump 1,500,000 cubic feet of fresh air a minute into the tunnels, and eight more will exhaust the same amount of stale air. Carbon monoxide will be held to two parts in 10,000—less than exists in the air at crowded street corners.

W. R. Fontaine is project manager for Six Companies' general contract; Justin Barber is outside superintendent; L. M. Larsen, tunnel superintendent; R. S. Barneyback, office manager; A. J. Orselli, project engineer.

Wallace B. Boggs is chief engineer of Joint Highway District No. 13 on the Broadway tunnel, with Joseph W. Barkley as chief assistant and A. R. Gelston as resident engineer.

The project is being financed by a PWA grant of $1,095,000, State Division of Highways appropriations totalling $700,000, and by bonds issued by Joint Highway District No. 13.

Flood Control

BOTH flood control measures, the omnibus and Overton bills, were approved by Senate and House when reports of conference committees were submitted. The bills then went to the President and were signed by him shortly before Congress adjourned.

The omnibus bill, authorizing an expenditure of $300,572,300 in all parts of the country, provides for several hundred projects. Flood control as a federal government activity is endorsed by the bill, and local governments are required to provide land, assume damages and maintain completed projects.

The Overton bill, embodying a flood control system proposed by General Markham, Chief of Engineers, authorizes expenditure of $272,000,000 for projects on the lower Mississippi. This bill also retains the contested principle of local contribution.

According to War Department officials, approximately $40,000,000 will be spent on the lower Mississippi in the fiscal year begun July 1, 1936. Of this $10,000,000 comes from unexpended, unobligated current appropriation; $15,000,000 from the new War Department appropriation bill, and $15,000,000 either from a new appropriation or from relief funds.

All-American Canal Forges Ahead

A TOTAL of 34,994,900 cubic yards of earth and rock has been moved on the All-American Canal since construction began seventeen months ago. The dirt has been flying at a rate which would dig a hole every day big enough to hold an 18-story building.

While a dozen contractors are at work on various sections and structures of the canal, the largest volume of excavation so far has been done by W. E. Callahan Construction Company and Gunther and Shirley, who are digging through a range of sand hills lying along the Colorado River. A total of 26,565,400 yards, or 68 per cent of

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• *W. E. Callahan Construction Company are using this Bucyrus-Monighan 10-W Diesel walking dragline on the contract they share with Gunther & Shirley on the All-American Canal. These companies have excavated 26,565,400 yards, 69 per cent of their contract.*

their contract, has been excavated by these companies.

Excavation of the canal through the irrigated section of the Imperial Valley was done by government forces, as many as 300 men and teams recruited from nearby farms being at work on this section. With the completion of the 17½ miles excavated in this fashion, the force account work has been wound up.

R. B. Williams, construction engineer in charge of the canal and the Imperial Diversion dam at its head, has reported that a total of 279 carloads of materials have been received from 12 states for use in construction of the canal. The largest items in these materials were: 124 cars of lumber, 51 cars of reinforcement steel and 39 cars of cement. The states where the largest number of carloads originated were California, 115 cars, and Oregon with 119 cars.

Funds for Continuing PWA

THE public works amendment adopted by the Senate as a part of the 1936 Deficiency Appropriation Bill, signed by the President before Congress adjourned, will permit the Public Works Adminstration to launch a new non-Federal public works construction program costing between $500,000,000 and $600,000,000.

In explaining the effect of the public works amendment Senator Hayden of Arizona said:

"By utilizing the accumulated assets of PWA's three years of successful operation, the amendment overcomes the objections which had been made to earlier suggestions for continuing the PWA program by:

"**First:** insuring continuance of the PWA non-Federal program without disturbing budget policy and without increasing the amount of the appropriation approved by the House of Representatives in the Deficiency bill, and

"**Second:** achieving this end without earmarking any of the $1,425,000,000 appropriated in the Deficiency bill for relief and work relief, so that there will be no curtailment or interference with this portion of the reemployment program.

"This desired end is attained through releasing the cash and credits now in the PWA revolving fund so that $300,000,000 may be used by PWA for making grants to aid in the construction of additional non-Federal public works projects. Under existing law the moneys in the PWA revolving fund are available only for loans and can not be used for grants. For more than a year PWA has been making loans from its revolving fund and grants from rescinded allotments made from the appropriation to carry out Title II of the National Industrial Recovery Act or from the $345,000,000 allocated to it by the President from the 1935 Appropriation of $4,880,000,000. All the PWA funds which were available from these sources for grants have been expended or obligated.

"Under the public works amendment adopted by the Senate, PWA may use up to $300,000,000 of funds on hand or hereafter to be received from the sale of securities for making grants. The amendment restricts the amount of the grant which can be made for any particular project to an amount not in excess of 45 per cent of the cost of the project. Loans and grants can be made only for projects which are capable of being substantially completed by June 30, 1938."

Officials of the PWA reported that approved projects are "ready to go" and the new construction program can be launched within a short time now that the Deficiency bill has been passed and signed.

Grand Coulee

CONSTRUCTION of Grand Coulee Dam is six months ahead of schedule, according to a recent report by John C. Page, Acting Commissioner of Reclamation.

"The excellent rate of progress

(*Continued on Page 370*)

• *While waiting between contracts, this Bucyrus-Erie 21-B dragline, which happened to be resting on a barge in the Hillsborough River, was used to launch "Miss Lois" a 25-foot boat, weighing about a ton. The boat was tied to the end of the 45-foot boom and was swung through the air to the opposite side where it was gently deposited on the water. The dragline is owned by Shell Producers Co., Tampa, Fla., and has recently been used in levee work at Charleston, S. C. It is equipped with a 45-foot boom and uses a 1-yard bucket.*

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3 Distributors' shops are equipped with high-speed tool equipment designed and built by "Caterpillar" for quality work at low cost.

4 Distributors carry complete stocks of low-priced genuine "Caterpillar" parts, for the oldest as well as the newest models.

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This complete service is designed to keep every "Caterpillar" Tractor working—that's why "Caterpillar" is always first in every SHOW-DOWN! Caterpillar Tractor Co., Peoria, Ill., U. S. A.

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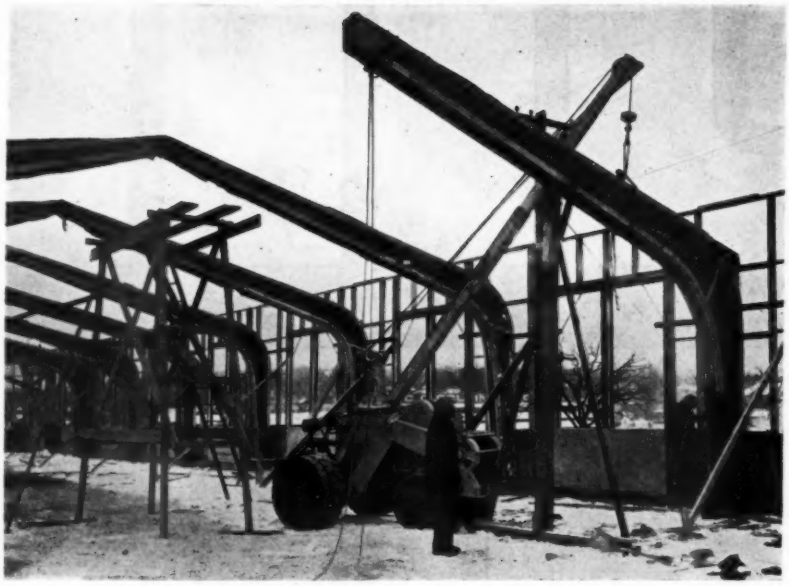
• *The adaptability of pre-fabricated units of wood to modernism in design and construction has been proved in a test and garage building recently built by Forest Products Laboratory, Madison, Wisconsin. Testing unit, illustrated here, is 160 feet long, 46 feet wide, 12 feet high at the walls and 19 feet in the center. Plywood is used for outside wall finishing, inside lining and roof sheathing. Arches are built-up, some glued and some solid timber. The cost, 15½ cents per cubic foot, and the appearance of the building compare favorably with standard construction and use of pre-fabricated plywood units increases the speed of erection.*

(*Continued from Page 366*)

established early in the construction of this project has been more than maintained," Mr. Page said. "The contractor has been gaining steadily on the time allowed him. He was notified to proceed with construction in September, 1934. Only 37 per cent of the alloted time has been used to date. The contract, however, is 51 per cent complete.

Frank A. Banks, Bureau of Reclamation Construction Engineer in charge of Grand Coulee noted that a total of



18,853,000 yards of earth and rock has been excavated at the damsite. Virtually no excavation remains to be done on the west side of the Columbia River, where the last of the bedrock is being cleaned preparatory to pouring concrete over the entire area.

Since December 6, a total of 515,000 cubic yards of concrete has been placed in the west excavation. In May, 182,970 yards was poured, the record for a single day being 7,200 yards.

32 States Undertake Highway Planning Surveys

COMPREHENSIVE highway planning surveys conducted by state highway departments, with the advice and guidance of the United States Bureau of Public Roads, are under way or about to be undertaken in 32 states. It is believed that the completed studies will point the way for the development of long-term highway programs and tax reduction.

These projects will include an inventory of every mile of passable road in each state, a study of the character and extent of traffic on the various roads, and a careful examination of highway costs, expenditures, and revenues. The factors of capital cost, road life, and maintenance cost also will be considered.

To cover the costs of the survey there will be available in each state 1½ per cent of the following funds, as apportioned to that state: The 1935 Public Works Fund as provided under the Hayden-Cartwright Act; the 1936 fiscal Federal Aid apportionments; and the Works Progress Administration Highway and Grade Crossing apportionments. In addition to these funds the state must match the monies of the Federal Aid funds used. A number of states have already arranged for separate W.P.A. projects, some of which have been approved.

It is expected that the survey will cover a full year. Analysis of the records, maps, and other data accumulated is expected to take another year. The results of the survey and the analyses made will be developed into a report which carefully evaluates and outlines the complete highway picture. This program will substitute an acceptance of a perpetual and continuing obligation of maintenance and rebuilding when necessary for the present casual treatment of roads, year by year, with annual demands and appropriations.

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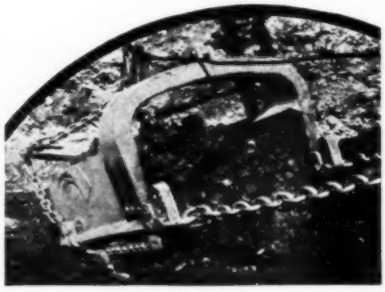

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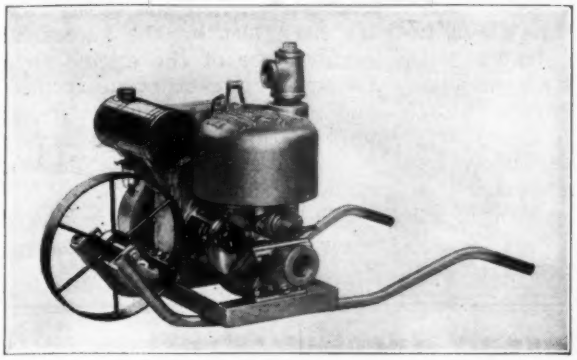

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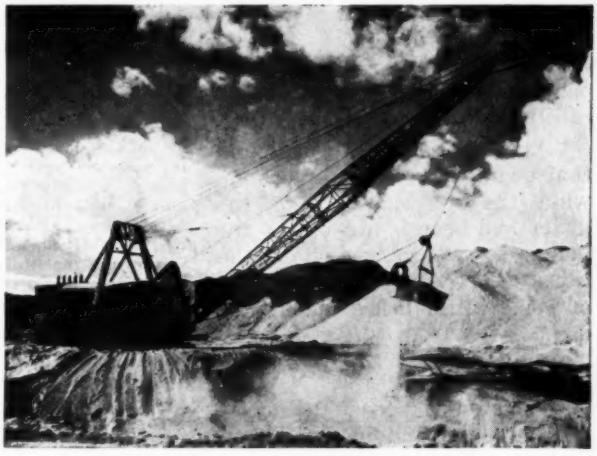

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Westinghouse
ELECTRIC SHOVEL DRIVES

Digging by "Stame"

(Continued from page 360)

"Our journey over the Camden, and Amboy, and Trenton and Philadelphia Railroads, was highly interesting, and the conversation of that evening will long be remembered with pleasure. We arrived at Philadelphia about midnight and for sundry mistakes and mischances, succeeded in obtaining some repose.

"On Tuesday morning two cars drawn by horses, set out with a party of upwards of forty. We arrived at the foot of the inclined plane before 6 o'clock, while the rails were yet quite wet with dew.

"On our arrival, it was found that owing to accident or design, while the fire was burning, the water had been blown out of the boiler so as to endanger the tubes. The result was a leakage of some consequence during the day.

Over She Goes

"The engine started at the foot of the plane and on the plane. After proceeding a few feet, the wheels were found to slip, and the engine returned. It was said that the rails were found to have been oiled at this place, a small quantity of sand was strewn over the spot, and the engine again proceeded. She regularly and steadily gained speed as she advanced to the very top, passing over the plane in 2 min. 24 sec. The enthusiasm of feeling manifested cannot be described, so complete a triumph had never been obtained,—the doubts that had been entertained by some, and the fears of others, were dispelled in an instant, the eager look that settled upon everyone's face gave way to that of confident success, while all present expressed their gratification in loud and repeated cheers.

"The length of the plane is 2800 feet. The grade is 369 feet to the mile, or 1 foot rise in 14.3, which is a much steeper grade than the planes on the Mohawk and Hudson Railroad, those being 1 in 18.

"Making an ascent of 196 feet in 2800 feet.

"Weight of engine with water 14,930 lbs.

"Load drawn up the plane, including weight of tender with water and coal, two passenger cars and 53 passengers, 31,370 lbs.

"Pressure in the boiler, less than 80 lbs. to the square inch.

"Time of running 2 min. and 24 sec.

"It is to be remembered that the rails were wet with dew.

"As to the oil, is was afterwards mentioned that bets were made with the workmen to a considerable amount and those, having been lost by the successful performance of the engine on a former day, were now quadrupled, and to save themselves it is not unlikely that this means was provided to accelerate the descent rather than the ascent.

"The party again embarked after examining the workshops,

(Continued on page 374)

Joseph Harrison, Jr.

JOSEPH HARRISON was apprenticed at the early age of 15 to Frederick D. Saws to learn the machinist trade, but after about two years Saws failed, and Harrison signed apprentice papers with James Flint, with whom he remained until he was 22 years old. After serving as machinist for a short term, he made a gesture to operate a shop of his own at Port Carbon, Pa., but soon accepted a foremanship with William Norris, then a well-known manufacturer of locomotives.

Garret and Eastwick were not as well known locomotive builders as either Norris or Baldwin and, appreciating the need of improving their prestige and product, they persuaded young Harrison, now 25, to accept the foremanship of their shop. In two years he became a junior partner and in 1839 he bought out Garret and thereafter the firm was known as Eastwick and Harrison. Therefore, really the first shovel built in Philadelphia was built by Garret and Eastwick not Eastwick and Harrison.

During this period Harrison became famous by designing what was called the "Gowan and Marx" locomotive. This locomotive weighed 11 tons and attracted world-wide attention on account of its performance.

Because of the fact that the engines being built by the firm of Eastwick and Harrison contained certain valuable features patented by either Mr. Eastwick or Mr. Harrison, representatives of the Russian Government selected their company to build locomotives for the railroad contemplated between St. Petersburg and Moscow.

On the invitation of the Russian Government, Mr. Harrison left in the spring of 1843 for St. Petersburg and concluded a contract at the end of that year for the building of 162 locomotives and iron trucks for 2500 freight cars. Mr. Eastwick joined him in the latter part of 1844, after closing their shop in Philadelphia and removing most of the "tools and instruments" to St. Petersburg.

According to one account, a factory 375 feet long by 60 feet wide was built for the purpose of constructing equipment for the railroad.

This plant was known as the Alexandrofsky Mechanical Works. Some description of the methods of handling labor may be found in the following quotation:

"To keep order among such a congregation—exceeding the whole population of a good-sized town, and consisting of English, Americans, Scotch, Irish, Germans, and Russians—a company of soldiers is kept on duty at the works, and a perfect police force, whose duties are confined to the establishment. Refractory men of every nation are discharged for irregular conduct, excepting Russian, and these (we suppose it is to inspire them with a love for their country and admiration for the gentle Nicholas) are, for the slightest offense, immediately tied up to the triangles, soundly flogged, and sent again to their work. It is but justice to Messrs. Eastwick and Harrison to say that they have strongly appealed against this treatment, so peculiar to this semi-barbarous nation, but without effect. The plan of paying this enormous multitude is ingenious; on being engaged, the man's name is, we believe, not even asked, but he is presented with a medal, numbered: in the payhouse are 3500 wooden boxes, and, on presenting himself on Saturday night for his pay, the clerk hands him his money, takes his medal as a receipt, which is dropped into the box of its number, and gives him another medal, as a pledge of engagement for the following week."

It was reported that the factory was able to turn out six cars and passenger carriages all finished per day, and three locomotives per week.

Incidentally, this same article also adds "and the employment of the railway excavator has served greatly to accelerate progress."

In 1852, Harrison returned to Philadelphia to lead a life of retirement and ease. He is reputed to have been the first resident of that city to own a private art gallery. In his boyhood days he had frequently been told the story of the Blacksmith and King Solomon, so he had an artist paint a picture portraying this story for his gallery and anyone interested will find the picture, the story, and more about Harrison in "The Ironworker and King Solomon" — a story he wrote for his children and grandchildren, printed in 1869.

After a few years, he began to tire of idleness and built a plant to manufacture a patent boiler known as the Harrison boiler. He died at Philadelphia on March 27, 1874.

1882.—IMPROVED IRON STEAM SHOVEL AND DERRICK,

MANUFACTURED BY THE

INDUSTRIAL WORKS, - - BAY CITY, MICH

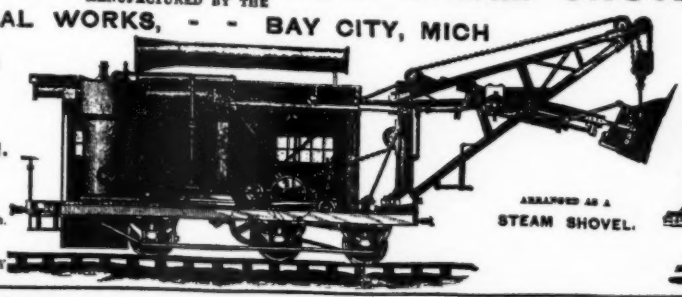
TURN-TABLES

OF

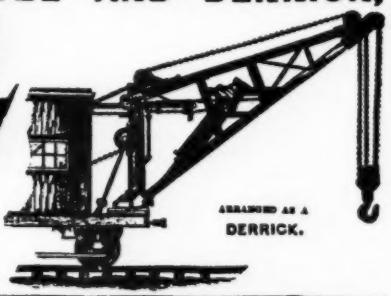
Iron and Wood.

C. E. WELLS, Sec'y. Bay City, Mich.

HOMANS & BRO., 59 Gold street, N. Y.



ARRANGED AS A STEAM SHOVEL.



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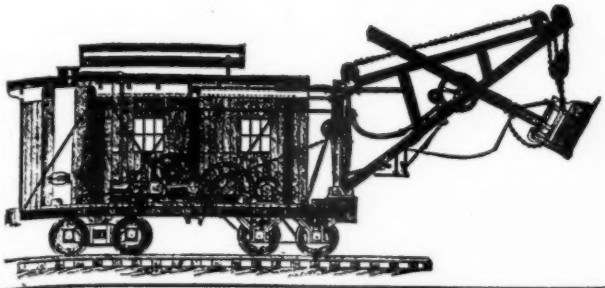
THe "Thompson" Iron Steam Shovel and Derrick.



BUILT UNDER LETTERS PATENT BY THE

BUCYRUS FOUNDRY & MFG. CO.,

BUCYRUS, OHIO.

HAND CARS, PUSH CARS, BALLAST UNLOADERS,

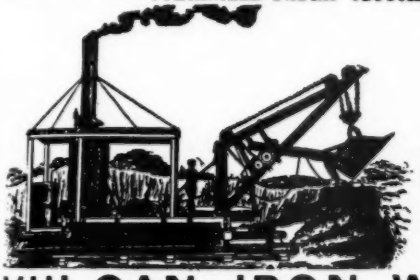
Steel Frogs & Switches, Loco. Cylinders & Drive Wheels,

AND EVERY VARIETY OF

CAR AND ENGINE CASTINGS.

NEW FRICTION CLUTCH STEAM SHOVEL.

VULCANIZED PAPER CLUTCH.



PATENTED MAY 3, 1882.

THE BEST

EXCAVATOR

IN THE WORLD.

VULCAN IRON WORKS,

BUILDERS AND PATENTEES,

OSWEGO, N. Y.

DREDGES

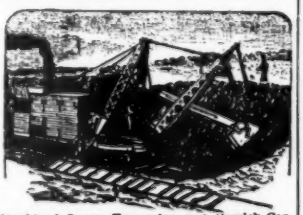
guaranteed to excavate 50 per cent. more material from hard bottom than any other machine.

EXCAVATOR

has a capacity of 4 cubic yards per minute in gravel. Has proved very efficient and desirable in the hardest hard-pan. Derrick lifts 8 tons.

Circulars furnished.

COMBINATION DREDGE.



Combined Steam Excavator and Derrick Car.

OSGOOD & MACNAUGHTON,

ALBANY, N. Y., PATENTEES.

Successors to RALPH R. OSGOOD, Troy, N. Y.

JOHN SOUTHER & CO., BOSTON, MASS.,

EXCLUSIVE MANUFACTURERS OF THE OTIS

Patent Steam Excavators.

WITH CHAPMAN'S IMPROVEMENTS AND DREDGES

RAILROAD STEAM EXCAVATORS,

Railroad Car Pile Drivers, Steam Pile Hammers.

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Iron and Steel Working Machine Tools, for Railways Machine Shops, Rolling Mills, etc.

PIVOT BRIDGES---SHAFTING.

TWEDDLE'S HYDRAULIC RIVETER.

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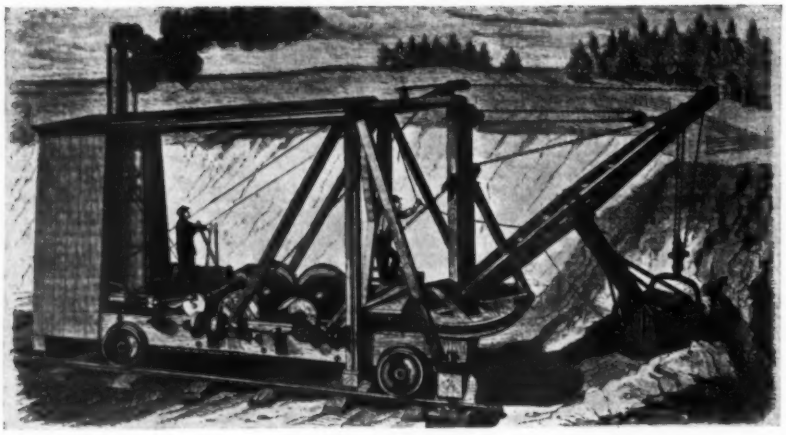

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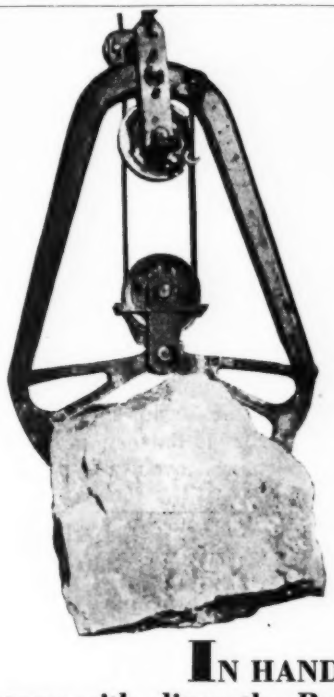

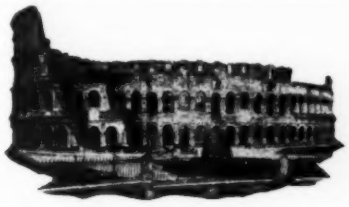

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SOUTH MILWAUKEE, WISCONSIN

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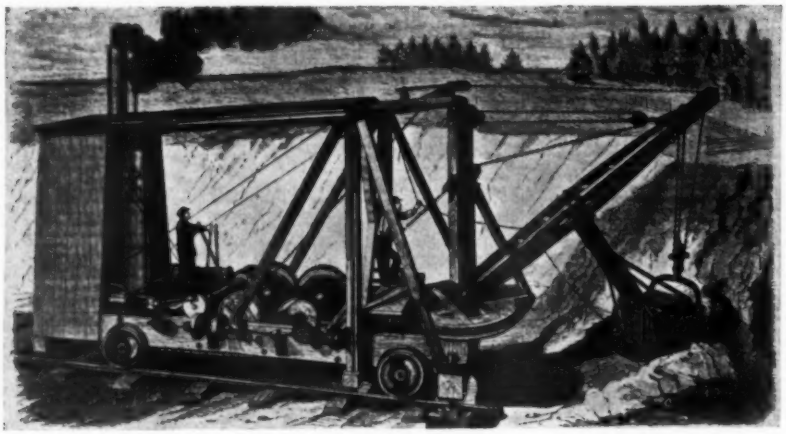

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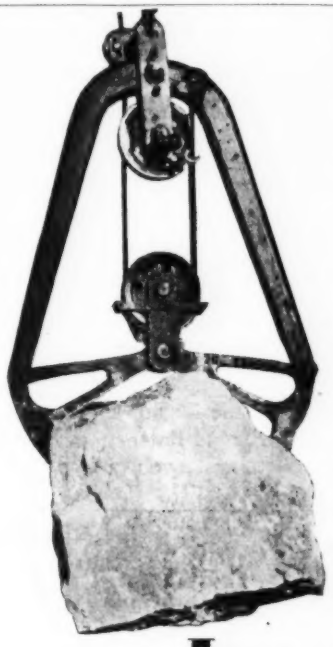

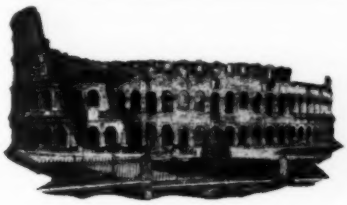

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Building Airport in Singapore

(Continued from page 347)

varying from 10 to 25 acres by the introduction of bunds. The bunds having been completed, the principle has been followed of pumping out the water and allowing the ground to dry and harden in the tropical sun. This ensures a solid base for the fill. It has been found necessary to lay the fill in approximately even layers in order to avoid spewing up as a result of uneven pressure.

In the process of filling in some of the depressions, piles are driven and formed into trestles to carry the light rails. The cars, loaded with earth, are then pushed on to the rails over the depression and tilted to discharge their contents. The driving power for the piles consists of half-a-dozen bare-footed coolies jumping on the tops with a constant babble of native lingo, and doubtlessly with many wisecracks incomprehensible to the white man.

Channels for seaplanes are being cleared by means of two Ruston-Bucyrus grabs working from pontoons, the mud and silt being lifted on to barges for disposal by dumping at sea. The task is not a trifling one for an anchorage 4,500 feet in length is required.

The surface and subsoil drainage are other items necessitating some consideration, and for the excavation of the major trenches a Ruston-Bucyrus 1030 machine has been in use. The machine served the double purpose of excavator and crane, the grab being temporarily removed so that the machine could be utilized for placing the concrete pipes into position, the grab being subsequently replaced for use in the filling in of the trenches.

The work of reclamation should be completed some time in 1937. Consolidation has been carried on with a battery of tractors and rollers over a long continuous period. The domed surface is to be finally completed with a top soil dressing which has been selected and placed aside for future use. It will then be turfed over with a grass which has been specially selected for its quality of toughness. When the work is completed another great link will have been cast in the chain of air services. It will become a landmark in the progress of air borne mail and passenger services, also a monument to the modern mechanical excavator, in the absence of which, with its great reliability and the time saving factor, the work could not have been completed, except with an extended time limit and at a greatly increased cost.

"I'll be frank with you," said the young man when the embrace was over. "You're not the first girl I ever kissed."

"I'll be frank with you," she answered. "You've got a lot to learn."

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Book Reviews

What Will Social Security Mean to You? is the title of a booklet published by the American Institute for Economic Research. This booklet discusses just how the Social Security Act will react on your life and mine, shows what we as individuals will have to pay for old age pensions and unemployment insurance. Possibilities for abuse of the act are discussed, together with probable effects on general business. Constitutionality of the act is briefly treated. The booklet is practical and written in non-technical style. Copies may be obtained for one dollar from the American Institute for Economic Research, 1200 Mass Avenue, Cambridge, Massachusetts.

Sullivan Machinery Company, Claremont, New Hampshire, recently issued two new illustrated bulletins. One, entitled "Sullivan Writes a New Chapter," describes the company's new detachable bits, including a list of the outstanding features. The second bulletin has the company's new drifters as subject. A cross-section diagram illustrates features of the equipment and field views are shown. Copies may be obtained by writing to the manufacturer at 307 North Michigan Avenue, Chicago, Illinois.

Ingersoll-Rand has published a catalog covering the company's "Type 30" line of Industrial Compressors and Vacuum Pumps, 28 pages and cover. Compressors single—and two-stage, ¼ to 15 h.p., 1.2 to 102 cu. ft. per min., pressures to 1,000 lbs., vacuums to within .35" (Hg) of barometer are described. Units mounted on horizontal and vertical tanks are shown; also units unmounted, and mounted on carriages.

A copy may be obtained from Ingersoll-Rand, 11 Broadway, New York.

Road Builders Lubrication Guide is the title of an illustrated booklet recently published by the Keystone Lubricating Company, Philadelphia, Pa. This booklet describes the various types of Keystone lubricants, and recommends the proper use for each. The recommendations and methods of application for power excavating and other road building equipment are summarized in outline on one page. Copies of the booklet may be obtained by writing the manufacturer.

Practical Guide for Tire Combinations on 1½-ton and Larger Trucks is the title of a recent publication by the B. F. Goodrich Company of Akron, Ohio. Among the information made easily available by this use of this guide is:

Probable life of present tire equipment, correct sizes and actual truck tire costs.

Both the new guide and a new tire calculator giving a variety of practical information, may be obtained by writing the manufacturer.

Recent developments in construction, America's "key" industry in present national employment problems, are presented in a survey, **"The Construction Industry,"** made public by the Commerce Department. The report combines an analytical discussion of the construction industry with a practical handbook or guide to the industry as represented by its leading trade associations.

The study presents a coordinated picture of all construction activities in the United States, and a running summary of trends in recent years for the various fields of construction, including commercial, industrial and residential buildings, road construction, and the programs of Governmental and public utility agencies. It also contains a summary of 1935-1936 projects and plans of the Federal Government in power and irrigation dam construction.

This study may be obtained for 10 cents from the Bureau of Foreign and Domestic Commerce in Washington, D. C., or any of its district offices in larger cities throughout the United States.

» » POWER CABLE « «

THE sturdiest electric excavator is only as dependable as its power cable. With that in mind, Bucyrus-Erie offers a three-conductor cable that is —

Compact... Flexible... Long-lived... Vulcanized to produce a non-porous rubber jacket, absolutely waterproof and highly resistant to oils and acids.

Each individual conductor is effectively treated to prevent power leakage.

Protect yourself from delays on the job by using a power cable which has proved its claim to toughness in the field. 1934

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EXPERIENCED OPERATOR

Experienced shovel-dragline-crane - clamshell operator desires work anywhere, preferably in foreign country. Twenty years' experience includes work on gas, electric, Diesel and steam machines. Can do own repair work. Best of references. Present location West Virginia. Box 8006.

DRAGLINE OPERATOR

Operator experienced on levee, revetment and drainage work desires work on Bucyrus-Erie steamer, any size. Seventeen years on dragline, two on clamshell and one on crane. One year each on gasoline and Diesel machines. Can do own repair work. Will go anywhere in U. S. Age 36; married. A-1 references furnished. Located in Missouri. Box 8107.

SHOVEL-DRAGLINE OPERATOR

Experienced shovel and dragline operator, 10 years on gasoline and Diesel machines on highway, railroad, mining, power dam and river work desires position on railroad or dam construction operating gas or Diesel machine any size. Can operate dredge. Willing to go anywhere. Age 34; married. Can do own repair work. A-1 references. At present located Upper Michigan. Box 8104.

STEAM SHOVEL OPERATOR

Have 25 years' experience on steam machines on all kinds of construction work. Desire position on any make, size or type steam shovel; anywhere. Can do own repair work. Best references furnished. Age 50. Married. At present located in Missouri. Write Box 8105.

DRAGLINE OPERATOR

Operator having 20 years' experience—eight years on shovel, ten years on dragline and two on clamshell—desires work on dragline, preferably gas or electric. Experience includes work on levee building, railroad construction, drainage ditches and in quarry. Can do own repair work. Age 42; married. Willing to go anywhere for steady work. Best of references. Located Southern Ohio. Box 8003

STEAM SHOVEL OPERATOR

Twenty years' experience on steam shovels on contracting and railroad work qualifies me to operate your steam machine. Age 44; married. References. Now located Southern Idaho. Box 8102

OPERATOR

12 years' experience on steam shovels, locomotives, cranes, clamshells. Can do own repairing. Willing to go anywhere. 30 years old and single. First class references. Now located in New York. Box 8106.

SHOVEL OPERATOR

Operator—10 years' experience on shovel, dragline and clamshell—on general excavation and mining—desires work on any make and type machine. Can do own repair work. Will go anywhere. Age 40; single. Best of references. Present location near Chicago. Box 8001

DRAGLINE OPERATOR

Experienced crane and dragline operator wishes work preferably on Bucyrus dragline or piledriver. Has operated steam and gasoline machines for 15 years. Willing to go anywhere in U. S. Can do own repair work. Age 39; married. Good references. Located near Chicago. Box 8002

For your convenience in writing to the Bucyrus-Erie Co., you will find a card bound in this issue.

EXCAVATING ENGINEER Bargain Counter

★ ★ ★ **THE ITEMS LISTED on these pages have been selected because they offer unusual values to the man who is looking for a bargain. Some of this equipment is surplus stock which has never been used, some is rebuilt and carries new equipment guarantee, some is just plain used. But every item is priced for quick sale. If any of this equipment fits your needs send a postcard or letter, mentioning the reference number, to *Bargain Counter, Excavating Engineer, South Milwaukee, Wisconsin.* We'll pass your inquiry along to the owner and you will receive price and complete information promptly. Act now — with advancing prices on new stock this equipment will move fast.**

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¼ CU. YD. DIPPER, 16' boom, 13'8" dipper handle. Shovel equipment suitable for type "A" shovel. NEW. SE-30.

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Skimmer Scoop

⅝ CU. YD. DIPPER—20' Boom together with all necessary ropes and material to completely convert Bucyrus-Erie 1020 Shovel, Clamshell or Dragline to Skimmer Scoop Machine. NEW. Shipment 2 to 3 weeks. SS-1.

Dragline Equipment

40' CHANNEL BOOM, FAIRLEAD AND ROPES, but not including bucket. For use on Model D-2—20-B—31-B. Used. DL-3.

BRAND NEW Ropes included with each of above Complete Equipments.

Trench Digging Equipment

1 CU. YD. 42½" WIDE—Solid type Dipper—24' Boom and all auxiliary equipment. Will dig maximum depth 22'. For application to GA-2 or GA-3 Shovel. Rebuilt—New Machine Guarantee. DS-5.

BRAND NEW PAGE, two dippers each ¾ cu. yd., one 38" wide over cutters, the other 49½" wide over cutters. 17'1½" Boom and all necessary auxiliary equipment. Will fit Bucyrus-Erie 1030 or 1035. DS-7.

1-CU. YD. 42½" WIDE SOLID TYPE DIPPER—24' Boom and all auxiliary equipment—will dig maximum depth of 22'—For application to GA-2 or GA-3 Clamshell or Dragline. **Rebuilt—New Machine Guarantee.** DS-8.

BRAND NEW Ropes included with each of above Trench Digging Equipments.

DIPPER HANDLES

1 7'6" 1030 TUNNEL—Complete. New. H-1
1 7'10½" 20-B TUNNEL (two sticks). New. H-2.
1 9'0" 31-B TUNNEL (two sticks). New H-3.
3 9'0" 30-B TUNNEL (two sticks each). New. H-4.
1 9'6" 20-B TUNNEL (two sticks). New. H-5.
1 9'6" 31-B TUNNEL (two sticks). New. H-6.
1 12'0" 18-B—Complete. New. H-7.
1 12'6" D-2, 31-B—Complete. New. H-8.
1 12'6" D-2, 31-B—Complete. New. H-9.
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3 15'0" E-2 41-B—Complete. New. H-13.
1 16'0" TYPE "A"—Complete. New. H-16.
2 16'0"—43-B—Complete. New. H-17.
1 17'0"—TYPE "A"—Complete. New. H-18.
1 17'0"—20-B HIGH LIFT—Complete. New. H-19.
1 17'0"—37-B—Complete. Used. H-21.
1 17'0"—50-B OIL (two sticks). New. H-23.
1 19'6"—37-B—Complete. New. H-25.

BOOMS

1—15'0" 1030 CHAIN CROWD SHOVEL BOOM—Used. JA-32.
4—18' 20-B STEAM SHOVEL BOOM—New JA-2.
1—18' 31-B STEAM SHOVEL BOOM—New. JA-3.
1—20'0" 1020 ROPE CROWD SHOVEL BOOM—New. JA-23.
1—20'0" 1020 ROPE CROWD SHOVEL BOOM—New. JA-33.
1—20'0" 1030 CHAIN CROWD SHOVEL BOOM—New. JA-24.
2—20'6" 20-B STEAM SHOVEL BOOM—New. JA-4.
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1—21'9" 31-B STEAM SHOVEL BOOM—New. JA-5.
2—22'0" 43-B CHAIN CROWD SHOVEL BOOM—Used. JA-27.
3—23' 20-B DIESEL, GAS OR ELECTRIC SHOVEL BOOM—New. JA-7.
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1—24'0" 43-B ROPE CROWD SHOVEL BOOM—New. JA-29.
1—24'0" GA-2 DRAG SHOVEL BOOM—New. JA-30.
1—24'0" GA-2 DRAG SHOVEL BOOM—Used. JA-34.
1—24'0 GA-3 DRAG SHOVEL BOOM—New. JA-35.
1—24' GA-2 or GA-3 SHOVEL BOOM—New. JA-8.
2—24' 43-B ROPE CROWD SHOVEL BOOM—New. JA-9.
1—25'0" 37-B ROPE CROWD SHOVEL BOOM—Used. JA-36.
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2—26' D-2 SHOVEL BOOM—New. JA-13.
1—26' 50-B STEAM SHOVEL BOOM—New. JA-15.
3—27' 43-B ROPE CROWD SHOVEL BOOM—New. JA-16.
1—27'0" 43-B ROPE CROWD SHOVEL BOOM—New. JA-31.
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3—30' 50-B STEAM SHOVEL BOOM—New. JA-18.
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DIPPERS

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3 ½ CU. YD.—Plate Front—Will fit 1020 Drag Shovel. New. D-45.

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1 2/3 CU. YD.—Plate Front—Will fit 14-B. New. D-13.

1 ¾ CU. YD.—Rock Type—Will fit 20-B New. D-67.

1 ⅞ CU. YD.—Ins. Tooth—Will fit 1030. New. D-47.

1 1 CU. YD.—Plate Front—Will fit 20-B. New. D-42.

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1 1¼ CU. YD. — Ins. Tooth — Will fit 37-B. Used. D-38.

1 1½ CU. YD.—Ins. Tooth—Will fit 42-B, 43-B. New. D-55.

1 1½ CU. YD.—Ins. Tooth—Will fit 43-B. Used. D-39.

3 1¾ CU. YD.—Ins. Tooth—Will fit 43-B. New. D-58.

1 ⅝ CU. YD. ROCK—Will fit 20-B. New. D-64.

1 1 CU. YD. PLATE FRONT—Will fit 30-B, 41-B, 42-B, E-2. New. D-65.

Large Machines

1 2 CU. YD.—Manganese—Will fit 43-B. New. D-62.

1 3 CU. YD.—2½" Molybdenum cast steel front, two part Van Port reversible teeth—Will fit 100-B, 68-C, 70-C. New. D-2.

1 3½ CU. YD.—2¾" nickel chrome steel front, two part Van Port reversible teeth—Will fit 88-C, 95-C, Class 80 Atlantic. New. D-3.

1 4 CU. YD.—2¾" Molybdenum cast steel front, two part reversible teeth. In good condition.—Will fit 100-C, 120-B. Used. D-4.

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1 8 CU. YD.—Front Molybdenum steel, two part Van Port Reversible teeth. Slightly used but excellent condition.—Will fit 320-B. Used. D-6.

DIPPER TRIPS

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1—31-B STEAM DIPPER TRIP—New. DT-2.

7—50-B STEAM DIPPER TRIPS—New DT-4.

BUCKETS

Dragline

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1 2 CU. YD.—BECO TYPE "U". 3650 lbs. Rebuilt. DB-12.

1 2 CU. YD.—BECO TYPE "X". 5300 lbs. New. DB-23.

2 2 CU. YD.—BECO HEAVY DUTY. 5400 lbs. New. DB-24.

3 2¼ CU. YD.—BECO TYPE "U". 3850 lbs New. DB-13.

2 2½ CU. YD.—BECO TYPE "U". 4100 lbs. New. DB-14.

1 2½ CU. YD.—BECO HEAVY DUTY. 6500 lbs. Rebuilt. DB-9.

1 2½ CU. YD.—OMAHA—STD. 5400 lbs. Rebuilt. DB-16.

1 5 CU. YD.—MONIGHAN HEAVY DUTY. 12000 lbs. New. DB-16.

1 6 CU. YD.—MONIGHAN TYPE "W". 12500 lbs. New. DB-17.

1 7 CU. YD.—MONIGHAN TYPE "W". 1370 lbs. New DB-18.

Clamshell

1 2 CU. YD. TYPE PF WILLIAMS CLAM-SHELL BUCKET without teeth and counter-weight. CSB-1.

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90 H.P. MOTOR — GENERAL ELECTRIC — 3 phase, 25 cycle, 550 volt, 1500 RPM. NEW. EE-1.

5 KVA TRANSFORMER—GENERAL ELECTRIC—2200-3810 volt primary, 440-220 volt secondary—3 phase, 60 cycle, with cast iron tank and cover, including specially fastened bushings to prevent oil leakage. NEW. EE-4.

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2—5 CU FT.—16" dia. x 48" high—225 lb. working pressure A.S.M.E. Std. Tested to 340 lb. cold water test. T-10.

1—14 CU. FT.—21½" dia. x 77" high—200 lb. working pressure. Will pass inspection in Massachusetts and any Canadian Province. T-12.

2 16 CU. FT—22⅝" dia. 77" high—200 lb. working pressure A.S.M.E. Std. T-13.

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Designed especially for application to Excavating or similar Equipment. Can be used for stationary or semi-stationary service.

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2—140 H.P. NEW, NON-REVERSIBLE ATLAS DIESEL ENGINES—5 cylinder, 9" bore x 10½" stroke. 514 R.P.M., 4 cycle, vertical overhead valves, dust proof, oil tight crank case and forced lubrication. Includes auxiliary air starting equipment. DE-2.

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1 12½"x16" link reversing type for Railroad Shovel. ME-1.

2 4½"x5" reversible—20.8 H.P. at 400 R.P.M. 100 lb. Pressure. ME-2.

1 4¾"x5" reversible—23.2 H.P. at 400 R.P.M. 100 lb. Pressure. ME-3.

1 5"x5" reversible—25.6 H.P. at 400 R.P.M. 100 lb. Pressure. ME-4.

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Will Make That Old Shovel Work Like New.

Can also be used for Miscellaneous Service

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2 11"x11"x12" STEAM DRIVEN LOCOMOTIVE TYPE, Westinghouse air compressors with fittings. NEW. AC-1.

1 11"x11"x12" STEAM DRIVEN LOCOMOTIVE TYPE, Westinghouse air compressors with fittings. Used. Make offer. AC-2.

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Under 2 Yards

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INSLEY COMBINATION GASOLINE SHOVEL AND DRAGSHOVEL—⅜ cubic yard. Located Massachusetts. Box 847-SS.

MICHIGAN 12 CU. FT. CAPACITY SHOVEL—¾ swing. Powered by McCormick-Deering 35 H.P. tractor unit. Located central New York State. Box 848-SS.

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BROWNHOIST MODEL NO. 2 ½ cu. yd. rope crowd gasoline shovel or clamshell. Waukesha four cylinder engine in good operating condition. Bargain price. Located near Peoria, Illinois. Box 689-SS.

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⅝-YARD

P&H MODEL 300 SHOVEL—18' Boom, 15' Dipper Handle, ⅝ cubic yard Dipper, manganese front. Powered with Waukesha B U 4½"x6¼" engine, power clutch control. First class operating condition. Located Massachusetts. Box 668-SS.

¾-YARD

BUCYRUS-ERIE TYPE B STEAM COMBINATION SHOVEL-CLAMSHELL AND STEAM HOE. Machine completely rebuilt 1929. Good operating condition. Located near Boston. Box 517-SS.

BUCYRUS-ERIE—TYPE B—Combination shovel and 40' boom crane. Boiler refued and the machine in fair operating condition. Located Arkansas. Box 815-SS.

BUCYRUS-ERIE TYPE B HIGH LIFT STEAM SHOVEL. Caterpillar mounted. Good operating condition. Located New Haven, Connecticut. Box 776-SS.

BUCYRUS-ERIE TYPE B CATERPILLAR MOUNTED, HIGH LIFT STEAM SHOVEL. Good operating condition. Located Connecticut. Box 775-SS.

BUCYRUS-ERIE TYPE B STEAM SHOVEL, Cat. mounted, equipped with 19'6" boom 16' dipper stick and ¾ yard dipper including 36' clamshell boom in good working order. Located near Hudson, Pennsylvania. Price $1000.00. Box 493-SS.

BUCYRUS-ERIE TYPE B STEAM SHOVEL, Cat. mounted, 19'6" boom, 14' dipper handle, ¾ cubic yard dipper, also 36' clamshell boom and front drum and gearing. Located Kansas City, Missouri. Box 622-SS.

BUCYRUS-ERIE 20-B COMBINATION STEAM SHOVEL - CLAMSHELL - DRAGLINE. Good working condition. Caterpillar Mounted. Located near Peoria, Illinois. Box 701-SS.

BUCYRUS-ERIE TYPE B STANDARD ¾ YARD STEAM SHOVEL—Quarry type Dipper — Caterpillar mounted. Good operating condition. Located Georgia. Box 752-SS.

TYPE B BUCYRUS-ERIE HIGH LIFT STEAM SHOVEL 21'3" Boom, 18'4" Dipper Handle. ¾ cubic yard inserted Tooth Dipper—Power Boom Hoist — Boiler Feed Pump — Caterpillar Mounted. Located Chicago. Box 699-SS.

KOEHRING MODEL 301. ¾ yard gas shovel. 20' Boom. 16' Dipper Handle. ¾ Yard Dipper. Wisconsin 5"x6" Engine. Located central New York. Box 852-SS.

MARION MODEL 21 ELECTRIC—M.G. SET ¾ YARD SHOVEL. Good condition. Located eastern Pennsylvania. Box 725-SS.

NORTHWEST MODEL 3 GASOLINE CABLE CROWD—FEATHER TOUCH CONTROL—SHOVEL. Good operating condition. Located Chicago. Box 798-SS.

OSGOOD MODEL 18 Steam—¾ yard shovel—Cat mounted. Just completely overhauled. Excellent condition. Located near Indianapolis, Ind. Box 522-SS.

⅞-YARD

BUCYRUS-ERIE HIGH LIFT STEAM SHOVEL. B-2—⅞ CUBIC YARD DIPPER. Favorable price. Located vicinity Boston. Box 793-SS.

MARION MODEL 21 — ⅞ CUBIC YARD STEAM SHOVEL. Caterpillar Mounted. Good working condition. Located Georgia. Box 758-SS.

BUCYRUS-ERIE B-2 HIGH LIFT STEAM SHOVEL. 19'9" Boom, 16' Dipper Handle, ⅞ cubic yard inserted tooth Dipper. Two speed propelling gear. Located Boston. Box 716-SS.

BUCYRUS-ERIE B-2 HIGH LIFT STEAM SHOVEL. 21'3" Boom—16' Dipper Handle—⅞ cu. yd. inserted tooth Dipper. Good operating condition. Located Boston, Mass. Box 853-SS.

BUCYRUS-ERIE B-2 HIGH LIFT STEAM SHOVEL. 19'9" Boom— 16' Dipper Handle—⅞ cu. yd. Dipper. Located near Boston, Mass. Box 854-SS.

1-YARD

BUCYRUS-ERIE LATE MODEL B-2 STEAM HIGH LIFT SHOVEL. 1 yard dipper—single shaft cat mounting. Good condition. Located near St. Louis. Box 518-SS.

BUCYRUS-ERIE—GA-2 GAS-AIR SHOVEL Extra High Lift. Caterpillar mounted. Good operating condition. Waukesha 5¾"x8" four cylinder gasoline Engine. Air Starter. Located Chicago. Box 754-SS.

BUCYRUS-ERIE GA-2 Gas-Air High Lift Shovel. 24' Boom, 18'4" Dipper Handle, 1 cubic yard Dipper. Single shaft cat. Waukesha four cylinder gasoline engine. Excellent operating condition. Located Milwaukee. Box 645-SS.

BUCYRUS-ERIE B-2 HIGH LIFT STEAM SHOVEL. Boiler A-1 shape. Main machinery overhauled last year. Practically new boom with engine. Located near Duluth, Minnesota. Box 794-SS.

BUCYRUS-ERIE B-2 HIGH LIFT STEAM SHOVEL. Caterpillar mounted. Good operating condition. Located Boston. Box 838-SS.

BUCYRUS-ERIE GA-2 1-yard dipper. Mounted on caterpillars. Located in Minnesota. Box 831-SS.

BUCYRUS-ERIE 30-B STEAM SHOVEL. Located St. Louis, Missouri. Box 817-SS.

31-B BUCYRUS-ERIE STEAM SHOVEL. 1-yd. dipper. For sale at $2,000 cash. $500 will put this machine in first class working condition. Shop No. 4853. Located western Tennessee. Box 822-SS.

FOR SALE

Address all box numbers c/o Excavating Engineer at South Milwaukee, Wisconsin

BUCYRUS-ERIE GA-2 — Gas-Air Combination High Lift Shovel and 50' Boom Dragline Equipment, mounted on Single Shaft Cat. Good operating condition. Located at Fort Smith, Ark. Box 537-SS.

BUCYRUS-ERIE MODEL B-2 High Lift Steam Shovel. Caterpillar mounted. Very good working condition. Located South Carolina. Box 644-SS.

BUCYRUS-ERIE GA-2 COMBINATION SHOVEL AND DRAGLINE. 22'6" Shovel Boom, 16' Dipper Handle, 1 cubic yard cast front inserted tooth Dipper. 50' Dragline Boom including Fair leads but not Bucket. Air Starter. Good condition. Located Newark. Box 718-SS.

BUCYRUS-ERIE GA-2 HIGH LIFT SHOVEL. 24' Boom—18'4" Dipper Handle, 1 cubic yard Inserted Tooth Dipper. Also includes Forward Drum and Gearing and mechanism for clamshell operation including 45' boom. Also 1 cubic yard Williams clamshell bucket. Waukesha WL Engine. Good operating condition. Located Chicago. Box 702-SS.

BUCYRUS-ERIE MODEL B-2 High Lift Steam Shovel. Caterpillar mounted. Good working condition. Located northern New Jersey. Price very reasonable. Box 643-SS.

B-2 EXTRA HIGH LIFT STEAM SHOVEL. 24' Boom—18'4" Dipper Handle—¾ yard Inserted Tooth Dipper—Boom Hoist—Caterpillar Mounted—Good operating condition. Located Chicago. Box 700-SS.

LORAIN—MODEL 60—One cubic yard Gasoline Shovel. Good condition. Located Chicago. Box 677-SS.

MARION 1 CUBIC YARD STEAM SHOVEL. Bargain Price. Box 777-SS.

P & H MODEL 600 ONE YARD GAS SHOVEL. Just recently overhauled. Excellent condition. Located eastern Pennsylvania. Box 855-SS.

P & H MODEL 600—1 yd. Gasoline Shovel—including 40' boom dragline equipment without bucket. Waukesha Engine. Recently overhauled. Located in Alabama. Box 483-SS.

P&H—MODEL 600—Combination 1 yard shovel and 40' boom dragline including dragline bucket. Waukesha gasoline engine. Machine in fair operating condition. Located Georgia. Box 695-SS.

1¼-YARD

BUCYRUS-ERIE — DIESEL-AIR — COMBINATION SHOVEL AND DRAGLINE. 22'6" Boom—16' Dipper Handle—1¼ cubic yard Iserted Tooth Dipper. 45' Boom. Complete Dragline Equipment without bucket. Engine—Atlas Diesel. Located Oklahoma. Good operating condition. Box 703-SS.

BUCYRUS-ERIE GAS-AIR TYPE GA-2 HIGH LIFT SHOVEL — 22'6" boom — 16' dipper handle—1¼ yard cast front inserted tooth dipper—single shaft caterpillar mounting—electric starter. Excellent condition. Field reconditioned. Waukesha 4-cylinder 6¼"x8" engine — New cylinder blocks and piston rings. Located near Scranton, Pennsylvania. Will demonstrate. Box 508-SS.

BUCYRUS-ERIE GAS+AIR—22' Boom, 16' Dipper Handle, 1¼ cubic yard Dipper, Waukesha 6¼"x8" four cylinder gasoline engine. Single Shaft Cat mounted. First class condition. Located eastern New York. Box 601-SS.

BUCYRUS-ERIE 37-B Gasoline Shovel. 23' Boom 17' Dipper handle. 1¼ cubic yard dipper. Chain Crowd. Wisconsin D-3 6-cylinder 5½"x6½" Engine. Reconditioned. Excellent condition. Located Vicinity of New York. Box 840-SS.

LIMA MODEL 101 — Combination 1¼ yard shovel and 40' plus 10' extension Dragline—powered with gasoline engine Model JK 6½" x7"—4 cylinder. Shovel equipment practically new. Located Colorado. Box 599-SS.

LINK-BELT MODEL K-42 1¼ YARD GASOLINE SHOVEL. Waukesha Model WL 6¼"x 8" 4-cylinder Engine—new blocks and pistons this year. Good working condition. Located Colorado. Box 738-SS.

LORAIN — 75-A — One and one-quarter cubic yard Gasoline Shovel. Good condition. Located Chicago. Box 676-SS.

LORAIN MODEL 75—1¼ YD. SHOVEL. 21'0" boom, 14' dipper handle. Also 45' plus 15', total 60', dragline boom and equipment, and 1¼ cu. yd. Page "M" dragbucket. Engine—Waukesha WL 6-cylinder 6¼"x8" gasoline. Located—Denver, Colorado Box 806-SS.

MARION TYPE 32 STEAMER. Shop No. 5676, 18' boom, 15' dipper handle, 1¼-cu. yd. dipper shipped May, 1926, good operating condition. Box 451-SS.

P&H MODEL 600—1¼ CUBIC YARD GASOLINE SHOVEL. Will be put in good operating condition. Located eastern Pennsylvania. Box 664-SS.

1½-YARD

BUCYRUS-ERIE 43-B GASOLINE CHAIN CROWD SHOVEL — 23' boom — 17' dipper handle—1½ cubic yard Vanderhoef dipper and teeth—electric starter—standard single shaft cat. Operated less than six months. Excellent appearance and condition. Will be demonstrated by owner. Located vicinity New York. No. 512-SS.

TWO LORAIN 75-B COMBINATION 1½ CUBIC YARD SHOVEL AND 50' BOOM DRAGLINES — without buckets. Gasoline power. Good working condition. Located eastern Pennsylvania. Box 721-SS.

LORAIN 75-B—1½ cubic yard Shovel and 50' Boom Dragline. Will sell as Shovel or combination machine. Good operating condition. Located eastern Pennsylvania. Box 722-SS.

OSGOOD "VICTOR" 1½ CUBIC YARD SHOVEL AND 50' BOOM CLAMSHELL MACHINE. Gasoline Power. Good operating condition. Located Wisconsin. Box 760-SS.

P & H MODEL 700—1½ CU. YD. GASOLINE SHOVEL. Engine: Waukesha 4-cyl. 7½"x8" Engine. Fair working condition. Located New Mexico. Bargain price. Box 789-SS.

1¾-YARD

BUCYRUS-ERIE 43-B CHAIN CROWD SHOVEL AND CLAMSHELL MACHINE. 22' Shovel Boom—16' Dipper Handle—1¾ yd. Dipper. 50' Boom Clamshell Equipment—no Bucket. Wisconsin Gasoline Engine. First-class operating condition. Located New York City. Box 856-SS.

BUCYRUS-ERIE—50-B—DIESEL SHOVEL. 38' Boom, Two 19' Dipper Handles. 1¾ Cubic Yard Rock Bucket and 1¾ Cubic Yard Dirt Bucket. 60' Boom Dragline Equipment without bucket included. Shovel only located Montana. Dragline equipment located Minnesota. Box 785-SS.

BUCYRUS-ERIE 50-B, 1¾ yard steam shovel, steel cab, may be inspected. Located Minnesota. Box 827-SS.

5—MARION MODEL 37, 1¾ yard steam shovels, steel cab. Good working condition. Located Minnesota. Box 825-SS.

2-YARD

BUCYRUS-ERIE 50-B — STEAM SHOVEL. 26' boom. 17' dipper handle. 2 cu. yd. dipper. 1½ KW Moon Lighting Plant. Excellent condition. Located St. Louis, Missouri. Box 819-SS.

BUCYRUS-ERIE 50-B STEAM COMBINATION SHOVEL-DRAGLINE. 26' boom, 17' dipper handle, 2 cubic yard dipper. 60' boom dragline equipment including 2 cubic yard Page Class M bucket and steam operated lighting plant. Machine can be placed in operation quickly with installation few small parts. Very attractive price. Located Alabama. Box 842-SS.

SMALL DRAGLINES
Under 2 Yards

⅜-YARD

⅜-YARD SARGENT SCOUT DRAGLINE. Powered with McCormick-Deering Model 200 4-cylinder 4¼x5 heavy duty gas engine. Cable speed 160 fpm, single line. Two traveling speeds. Capacity as crane from 8000 lbs. at 8 ft. radius to 2800 lbs. at 24 ft. radius. Iowa. Box 772-SD.

UNIVERSAL-UNIT ⅜ swing combination 30-foot boom gasoline dragline and ⅜ cu. yd. shovel. ⅜ cu. yd. dragline bucket. Working every day. Good condition. Located Grand Haven, Michigan. Box 769-SD.

½-YARD

SARGENT-JUNIOR — GASOLINE DRAGLINE. 36' Boom. ⅝ yd. Drag Bucket. Twin City 4-cylinder 4½"x6" Gasoline Engine. Good working condition. Located Missouri. Box 851-SD.

¾-YARD

BUCYRUS-ERIE 20-B COMBINATION STEAM DRAGLINE - CLAMSHELL - SHOVEL. Good working condition. Caterpillar Mounted. Located near Peoria, Illinois. Box 701-SD.

1-YARD

BUCYRUS-ERIE GA-2 COMBINATION DRAGLINE AND SHOVEL. 50' Dragline Boom including Fairlead but not Bucket. 22'6" Shovel Boom, 16' Dipper Handle, 1 cubic yard cast front inserted tooth Dipper. Air starter. Good condition. Located Newark. Box 718-SD.

LINK-BELT 1 CUBIC YARD CAPACITY 50' BOOM DRAGLINE WITHOUT BUCKET. Gasoline power. Reported good operating condition. Located near Chicago. Box 724-SD.

P&H—MODEL 600—Combination 40' boom dragline and 1 yard shovel including dragline bucket. Waukesha gasoline engine. Machine in fair operating condition. Located Georgia. Box 695-SD.

1¼-YARD

BUCYRUS-ERIE — DIESEL-AIR — COMBINATION DRAGLINE AND SHOVEL. 22'6" Boom—16' Dipper Handle—1¼ cubic yard Inserted Tooth Dipper. 45' Boom—Complete Dragline Equipment without bucket. Engine—Atlas Diesel. Located Oklahoma. Good operating condition. Box 703-SD.

FOR SALE

Address all box numbers c/o Excavating Engineer at South Milwaukee, Wisconsin

SMALL DRAGLINES
Under 2 Yards
continued

1½-YARD

LINK-BELT MODEL K-44 45' BOOM PLUS TWO 10' AND ONE 5' EXTENSIONS—TOTAL 70' DRAGLINE WITHOUT BUCKET. Gasoline power. Includes 800 Watt Kohler Light Plant. Located near Chicago. Good operating condition. Box 728-SD.

2 LORAIN 75-B COMBINATION DRAGLINES AND SHOVELS. 50' dragline booms without buckets. 1½ cubic yard shovel equipment. Gasoline power. Good working condition. Located eastern Pennsylvania. Box 721-SD.

TWO P&H 700 DRAGLINES. 1½ cu. yd. buckets on 50' booms. Gas and Diesel. Located Lower Rio Grande Valley, Texas. Box 618-SD.

SMALL CLAMSHELLS AND CRANES
Under 2 Yards

⅜-YARD

BAY CITY "PUP" CLAMSHELL MACHINE. Good operating condition. Box 514-SCC.

½-YARD

BYERS BEARCAT CLAMSHELL—Crane—30' boom. Will handle ½ cubic yard bucket. Located near Grand Rapids, Mich. Box 648-SCC.

GENERAL—GASOLINE—35' BOOM CLAMSHELL. Now operating near St. Joseph, Illinois. Box 782-SCC.

ORTON 24' BOOM—½ CUBIC YARD CLAMSHELL MACHINE. ½ cubic yard Owen Clamshell Bucket. Hercules 55 HP. Gasoline Engine. Factory rebuilt 1932. Good operating condition. Located Tennessee. Box 709-SCC.

¾-YARD

BUCYRUS-ERIE 20-B COMBINATION STEAM CLAMSHELL—DRAGLINE—SHOVEL. Good working condition. Caterpillar Mounted. Located near Peoria, Illinois. Box 701-SCC.

O & S MODEL "T" ¾ yard clamshell machine. 40' boom. Good working condition. Powered with Climax 5½"x7" gasoline engine. Located near St. Louis. Good working condition. Box 651-SCC.

1-YARD

BUCYRUS-ERIE GA-2 45' BOOM CLAMSHELL MACHINE. Single Shaft Cat. Waukesha 5¾"x8" four cylinder gasoline engine. Good operating condition. Located St. Paul, Minnesota. Box 761-SCC.

BUCYRUS-ERIE GA-2—45' BOOM CRANE. Waukesha gas engine. First class operating condition. Located Tennessee. Box 816-SCC.

1¼-YARD

P&H MODEL 700—50' BOOM CLAMSHELL MACHINE INCLUDING 1¼ CUBIC YARD OWEN CLAMSHELL BUCKET. Waukesha 6¼"x8" four cylinder gasoline Engine. Excellent condition. Located Chicago. Box 762-SCC.

NORTHWEST MODEL 105 Gasoline—40' boom clamshell. Good operating condition. Located Iowa. Box 516-SCC.

1½-YARD

OSGOOD "VICTOR" 50' BOOM CLAMSHELL MACHINE AND 1⅛ CUBIC YARD SHOVEL. Gasoline Power. Good operating condition. Located Wisconsin. Box 760-SCC.

You Do Not Find What You Want Listed—Write Us. Excavating Engineer

LARGE SHOVELS AND DRAGLINES
2 Yards and Over

1½-W MONIGHAN WALKER. Diesel power. 2 yard capacity. 60-foot boom Good condition Reasonably priced. Located Kansas. Box 742-LSD.

MARION NO. 60 SHOVEL—2½ yard, good as new. Eastern Iron & Metal Co., Sherman, Texas.

2-W MONIGHAN WALKER 3½ yard capacity. 70-foot boom. Good condition. Reasonably priced. Located Kansas. Box 743-LSD.

CLASS 230 STEAM DRAGLINE. 175-foot steel and aluminum boom. 6-yard RED ARCH bucket. Ready to work. Located near New Roads, Louisiana. Box 751-LSD.

TYPE 175-B ELECTRIC, No. 794 equipped with 87' shovel boom, 48' dipper handle, 3½-yd. bucket, and dragline equipment including 125' boom, and 3½-yd. bucket. This machine was recently reconditioned and is in good operating condition. Present, location, Connecticut. Box 263-LSD.

100-B STEAM SHOVEL, 3 yd. dipper, location Eastern Canada. Immediately available. Used—good condition. Box 669-LSD.

REQUIRING OTHER EQUIPMENT I have a 100-B, 3-yd., electric shovel for sale. Write Box 812-LSD.

100-C BUCYRUS STEAM SHOVEL on trucks, 3½-yard dipper. New 1914. Willing to sell very cheap. Located near Allentown, Pa. Box 807-LSD.

50-B STEAM SHOVEL, Number 3946; equipped with 1½-cubic-yard dipper, 26-foot boom, also 1½-cubic-yard dragline bucket with 50-foot boom caterpillar mounted, equipped for burning oil, located at Texarkana, Ark. Price $3,000. Box 112-LSD.

PAGE DRAGLINE, track mounted, 90-foot boom, 3½-yard Page RC bucket with new 150 h.p. Venn-Severin Diesel engine. Thoroughly overhauled and rebuilt in 1935. Now working in Indiana. Box 768-LSD.

ANY FAIR OFFER ACCEPTED
Class 24 steam dragline. 100 foot boom, 5 cubic yard bucket. Skid and roller mounted. Rebuilt 1927 at a cost of $15,000. New locomotive boiler installed 1928. Will accept any fair offer. Located near Fort Worth, Texas. Box 823-LSD.

FOR SALE OR RENT
TWO CLASS 14 STEAM DRAGLINES, 70-foot booms and 2-yd. buckets. Caterpillar mounted. Equipped for burning gas or oil. Located in southwest. Price at approximately $4,000 each. Box 821-LSD.

CLASS 320 STEAM DRAGLINE. 144-foot boom. 8-yard bucket. Located on Illinois River. A good buy. Box 750-LSD.

CLASS 14 DIESEL-ELECTRIC DRAGLINE, 70-foot boom. 2-yard bucket. Immediately available. Located near St. Louis. Box 749-LSD.

70-C BUCYRUS STEAM SHOVEL on Cats. Complete. In operating condition. Shop number 1712. Also one extra three-yard Manganese dipper and sticks. Chicago territory. Box 347-LSD.

MARION 480 2-YARD STEAM SHOVEL, good working condition. Substantial saving. Located in Minnesota. Box 826-LSD.

BUCYRUS-MONIGHAN 3-W walking dragline. 85' boom, 2½-yard bucket. Located Stovall, Miss. Box 843- LSD.

BUCYRUS-ERIE 70-C, 2½ yard steam shovel, railroad type. Located in Minnesota. Box 829-LSD.

P&H MODEL 900, 3½ yard Diesel Shovel. 33-foot boom, 200 h.p. Fairbanks-Morse engine. Mounted on caterpillars. Box 828-LSD.

CLASS 14 DIESEL ELECTRIC DRAGLINE for sale. 70' boom. Can be seen working during next 30 days. Good price. Southern location. Box 846-LSD.

BUCYRUS-MONIGHAN 4-W Walking dragline, 80' boom 5½-yard Page bucket, 30' boom insert and 4-yard bucket. Located Tennessee. Box 844-LSD.

3—MARION 92-M, 4-YARD RAILROAD TYPE steam shovels located near Hibbing, Minnesota. Box 830-LSD.

BUCYRUS-ERIE 50-B Steam shovel, located Montana. Attractive price. Box 845-LSD.

48-C BUCYRUS ELECTRICALLY OPERATED SHOVEL, equipped with 2½-yard manganese front dipper, 3 phase, 60-cycle, 440-volt motors, transformers, cable, reel and approximately 1400 feet of cable all in excellent condition. Reasonable price. Address Box 268-LSD.

3-W MONIGHAN DIESEL DRAGLINE. 85-foot boom. Electric Swing. 2 buckets—2½ and 3½ cu. yd. capacities. Located Evansville, Indiana. Might be loaded on barge. Box 787-LSD.

MONIGHAN DRAGLINE MODEL T, 2-cubic-yard 60-foot boom located near Wichita, Kansas. About seven years old. Has recently been thoroughly overhauled. Box 180-LSD.

FOR SALE

Address all box numbers c/o Excavating Engineer at South Milwaukee, Wisconsin

MONIGHAN STEAM DRAGLINE, two cubic yards capacity. 60' boom. Horizontal locomotive-type boiler. 2½-yard Page bucket. In good operating condition; overhauled in 1931 and not used. Located Iowa. Box 770-LSD.

CLASS 14 STEAM DRAGLINE, 60' boom. 2 cubic yard Page bucket. Locomotive-type boiler. Thoroughly overhauled and ready for service. Located Iowa. Box 771-LSD.

TWO 3-W MONIGHAN WALKERS. 3½ yards. 70- and 77-foot booms. Good condition. Reasonably priced. Located Louisiana. Box 745-LSD.

BUCYRUS 320-B STEAM STRIPPING SHOVEL, shop number 4205, new in 1925, used less than four years. Located at Toronto, Ohio. Box 74-LSD.

2-W MONIGHAN WALKER. 2½ yard capacity. 70-foot boom. Good condition. Priced reasonably. Located Louisiana. Box 744-LSD.

FOR SALE

USED 4-YD. 120-B ELECTRIC QUARRY SHOVEL. Reasonably priced. Can be inspected. Box 820-LSD.

LOCOMOTIVE CRANES

TWO AMERICAN STEAM LOCOMOTIVE CRANES. Each 8 wheel—25 ton capacity. Each equipped with 8¼"x10" double cylinder engine. Boom 50'. Steam brakes and train air line. Boiler 54"x101" ASME—130 pounds pressure. Standard gauge 4'x8½". Used only eight months. Splendid condition. Box 628-ME.

LOCOMOTIVES

LOCOMOTIVES

2 BALDWIN, 17x24, straight drive standard gauge 45 ton locomotives. 54 inch boilers. Shop numbers 33962 and 33266. Each one has passed State Boiler Inspection yearly. Boilers will stand cold water test of 240 lbs. At present in actual service in Minnesota mine. Box 152-ME.

MISCELLANEOUS EQUIPMENT

SHOVEL FRONT ENDS

1½ cu. yd. shovel front end—new dipper—for Marion 32 steamer. Priced right. Located near Chicago. Box 857-ME.

DRAG SHOVEL ATTACHMENT A BARGAIN

BRAND NEW PAGE DRAG SHOVEL EQUIPMENT suitable for application to Bucyrus-Erie 1030, 1035, or 32-B machines now in the field, consisting of 17'1½" boom, 11' dipper handle, and two ¾ cubic yard dippers; one 38" wide over cutters—the other 49½" wide over cutters together with auxiliary A frame and ropes. Priced below cost. Box 683-ME.

A BARGAIN
IN
MISCELLANEOUS EQUIPMENT

There is left only the following of a dirt moving outfit located near Fort Wayne, Indiana.

Select what you can use and MAKE AN OFFER.

1 Fairbanks Morse Gasoline engine and 5x5 bulldozer pump 3 HP.
2 Fairbanks Morse gasoline engine and 3x5 bulldozer pump 1½ HP.
4 Track jacks, 15 ton.
3 Track jacks, light.
1 Duplex Pump—Worthington. 5¼x3½x5.
10 Slips.
1 Anvil.
1 Forge
1 Carbide light.
2 Galvanized water tanks, wagon size.

BOX 811-ME.

Wanted

USED—one bag mixer with skip. Rubber tire mounted. Give condition, make, age, price and location. Box 858-ME.

PARTS—175-B Shovel—PARTS

1 Main Engine
1 Boom
1 Dipper Shaft
1 Crowding Engine
1 Five Yard Dipper

If interested in making a good buy on these shovel parts, write us. Box 607-ME.

SHOVEL FRONT ENDS

ONE COMPLETE 52-B DIESEL SHOVEL FRONT END. Consists of boom, dipper handle and 2¼ cu. yd. dipper. **TWO COMPLETE 52-B ELECTRIC SHOVEL FRONT ENDS.** Consist of Booms, dipper handles and 2¼ cu. yd. dippers. Motors on booms are 3-phase, 60 cycle, 2300 volt current. Box 741-ME.

REBUILT LOADMASTER

Model "MD" Loadmaster with McCormick-Deering Model 20 tractor, 14' boom, solid rubber tires, can be had at exceptional saving. For further particular write Tractor & Equipment Company, 433 South Jefferson St., Chicago, Illinois.

WELDING AND CUTTING OUTFITS

Complete Welding Outfits, $44.82. Combination Welding and Cutting Outfit, $59.81. Heavy Duty Cutting Outfit, $49.62. The Superior Oxy-Acetylene Company, Hamilton, Ohio.

COMPLETE CONTRACTORS EQUIPMENT

Offered for sale by Southern contractor. Priced to sell.

7—Railroad Type Steam Shovels 2½ to 5 yd.
3—Full Revolving Shovels, ¾ yd.
1—Gasoline Clamshell Crane, ½ yd.
2—Jordan Spreaders.
2—Locomotives, 26 Ton, American Saddle Tank.
32—12-yd. Western Heavy Duty Dump Cars.
1—Flat Car.
3—Camp Cars.
2—1-bag Gasoline Concrete Mixers.
Pumps, Boilers, Jacks and Other Tools.

For further particulars, Address Box 138-ME.

GOOD USED EQUIPMENT

Monighan 6160, 3W, & 2W Diesel Drags.
Bucyrus Cl. 24 Diesel-Electric Dragline.
Northwest 1 yd. Gas. Crane & Drag., A-1.
Shovel Fronts—For P&H 206, L-B, NW, etc.
B-G & Haiss Loaders. Universal Truckcranes.
Sauerman 1 yd. Drag Scraper outfit. Belted.
Williams Hammermills—No. 4 Jumbo, No. 3 & No. 0.
9x16 Port. jaw crusher. 24x36 Farrell 15-B.
Tractor Hoist, 2 drum, new. 2 Truck winches.
Hoists & Derricks. Clam & Drag. Buckets, etc.
James Wood, 53 West Jackson, Chicago, Ill.

ONE (1) PARSONS No. 40 TRENCHING MACHINE, 18' ladder with buckets for from 18 to 42" trench. In good mechanical condition. Located in St. Louis, Missouri. Price $5000.00 F.O.B. cars. Box 740-ME.

NO. 44 BARBER-GREENE DITCHER in good condition. Located near Polo, Illinois. Box 824-ME.

Pile Driving Leaders

One (1) set of pile driving leaders, 30' long, iron bound, in excellent condition, suitable for use with 2000 lb. drop hammer, located in St. Louis, Missouri. Price—$35.00. Box 788-ME.

COMPLETE EQUIPMENT for 2 strip mines, contractors or quarry operations, No. 300 and No. 36 Marion steam shovels, well drills, locomotives, cars, crushers, picking tables, loading booms, cable and button retarders, compressors, motors, transformers, flood and search lights, camp equipment and new repair parts for above. Box 195-ME.

DIPPERS—2½ CU. YD.

2—2½ cubic yard dippers for 70C Bucyrus steam shovel. One of these dippers is in good condition and the other has not been used since being rebuilt. Has set new Westico teeth. For particulars write Foley Brothers, Inc., New York Building, St. Paul, Minn.

SHOVEL FRONT ENDS

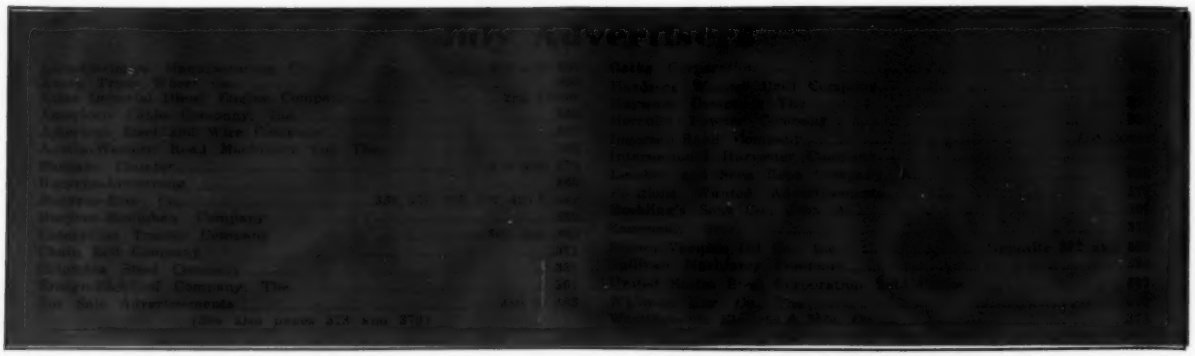
Two complete shovel front ends for Bucyrus-Erie 42-B steamers. 21' booms, 15' handles, 1½ cu. yd. Vanderhoef dippers. Priced to sell. D. E. Horton Constr. Co., Buffalo, N. Y.

MINING AND QUARRY EQUIPMENT

The following equipment is located in Minnesota. Full details on request.

5—Boilers
12—36" gauge Koppel double truck flat cars.
6—36" gauge Peteler 4-yard two way dump cars.
3—Crushers.
4—Swing & Boom engines for Marion 31 & 36 shovels.
1—Austin-Western grader, 8' blade & scarifier.
4—Hoists—Single and double drum.
3—Milwaukee gasoline locomotives, 7-ton 24" gauge.
2—Whitcomb gasoline locomotives, 7-ton, 24" gauge.
4—Electric motors, 100 to 150 h.p.
9—Pumps—Steam and gasoline.
5—Redwood tanks.
1—Special Twin City Tractor.
1—Complete Ainley Placer gold machine.

Box 833-ME.



BUCYRUS-ERIE COMPANY

Headquarters: SOUTH MILWAUKEE, WISCONSIN, U. S. A.
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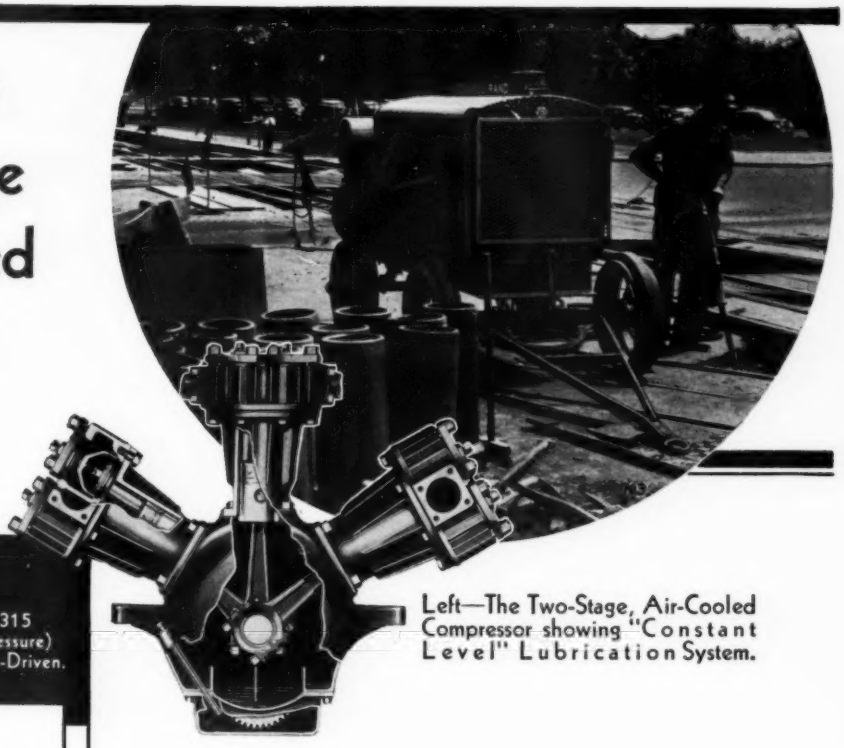

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